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ABSTRACT

An outline is presented for the scope and sequence of the following topics to be covered in grades K-8: sets, operations, number theory, measurement, geometry, and number sentences. Details of a coding scheme for mathematics units, exemplary units for each level, and a description of the procedures used to correlate science and mathematics courses are included in this document. This work was prepared under an ESEA Title III contract. (DT)

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ED 077769

# MATH...

# A K-8 SCOPE AND SEQUENCE

E.S.E.A. TITLE III

STAFF UTILIZATION FOR

CONTINUOUS PROGRESS EDUCATION

SCOTTSDALE PUBLIC SCHOOLS

SCOTTSDALE, ARIZONA

SE 016 408

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E.S.E.A. TITLE III

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## TITLES AVAILABLE ON MICROFICHE*

| | |
|---|---|
| CURR 000 001 | Language Arts Scope and Sequence (K-8) |
| CURR 000 002 | Language Arts Instructional Materials (1-2) |
| CURR 000 003 | Language Arts Instructional Materials (1-2) |
| CURR 000 004 | Mathematics Scope and Sequence (K-8) |
| CURR 000 005 | Mathematics Pre-Post Tests (3-4) |
| CURR 000 006 | Social Studies Scope and Sequence (K-8) |
| CURR 000 007 | Social Studies Instructional Units (K-8) |
| CURR 000 008 | Science Scope and Sequence (K-8) |
| CURR 000 009 | Science Course of Study (7) |
| CURR 000 010 | Science: 14 Self-Pacing Units (8) |
| CURR 000 011 | Art, Music, and Physical Education Scope and Sequence (K-8) |
| CURR 000 012 | Keeping Order (Coding): Instructional Materials, Audio-Visual Aides, Microfiche (K-8) |
| CURR 000 013 | Diagnosis: Academic Level & Performance Capabilities (K-8) |

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# MATHEMATICS CURRICULUM

# K-8 SCOPE AND SEQUENCE

# PUEBLO ELEMENTARY SCHOOL

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

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RATIONALE - MATHEMATICS CURRICULUM DEVELOPMENT

The Mathematics Curriculum team realizing the need to improve the existing curriculum and tailor it to a Continuous Progress Learning setting, constructed the attached K-8 Scope and Sequence. The concepts outlined in the Scope and Sequence are predicated on the following definitions:

Sets: Deals with problems of counting and reasoning

Operations: Practical application of matematical principles

Number Theory: Is the relationship of numbers

Measurement: Deals with the size of things

Geometry: Is the relationship among the measurement of figures

Number sentences: Is problem solving through equations

For each grade level K-8 the major instructional objectives of these concepts have been identified. As the instructional units for each concept are developed the following format will be used.

1. concept
2. instructional objective
   a) behavioral objective
   b) learning activities
   c) references (materials)
   d) evaluation techniques

The inception of this matematics curriculum was not dictated by building needs, but rather by the desire to sufficiently challenge Pueblo Elementary School students with a variety of experiences in mathematics so that they may better achieve their maximum individual potential. The learning activities in this program:

A. Are intellectually stimulating

B. Provide more flexibility for grouping and the movement of students from one group to another

C. Provide the students with an appreciation of mathematics and an understanding of its usefulness

D. Provide better articulation from one grade level to another of students skill development

E. Allow instructional managers more latitude for innovation.

We realize that curriculum change is a dynamic, systematic process, and in accordance with this dynamic quality, the continuous implementation of new ideas into the mathematics program will be based on:

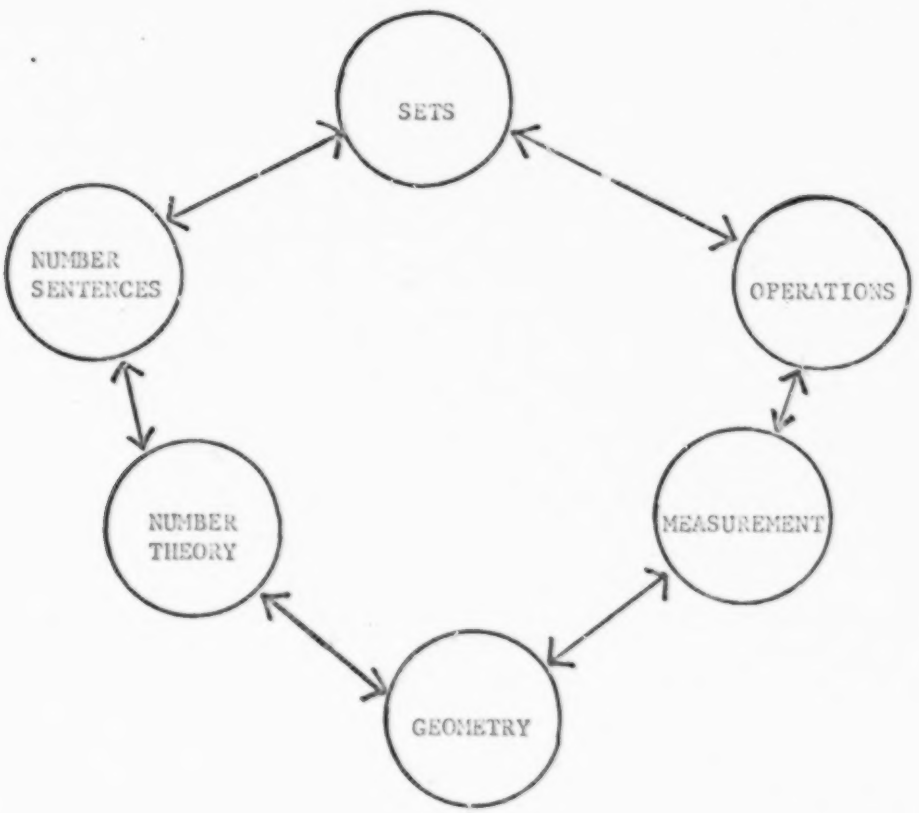
1) identification of needs

2) evaluation within the existing program

3) alternative proposals available

4) selection by curriculum teams

5) in-service implementation




The above diagram indicates the inter-relationship of the major concepts of the Mathematics Scope and Sequence. These concepts are defined as follows:

Sets: Counting and reasoning
Operations: Applications of mathematical principles
Number Theory: Relationship of numbers
Measurement: Size of things
Geometry: Relationship and measurement of figures
Number sentences: Problem solving through equations

## MATHEMATICS PHILOSOPHY

The mathematics program in a continuous progress setting should foster a positive attitude which will permeate the entire learning situation. Furthermore, the individual differences in learning styles among students necessitates a multi-sensory approach.

## DEFINITION OF MATHEMATICS

We can postulate that mathematics is a study of quantities represented by symbolic nomenclature, numbers, shapes, and the rules governing these quantities.

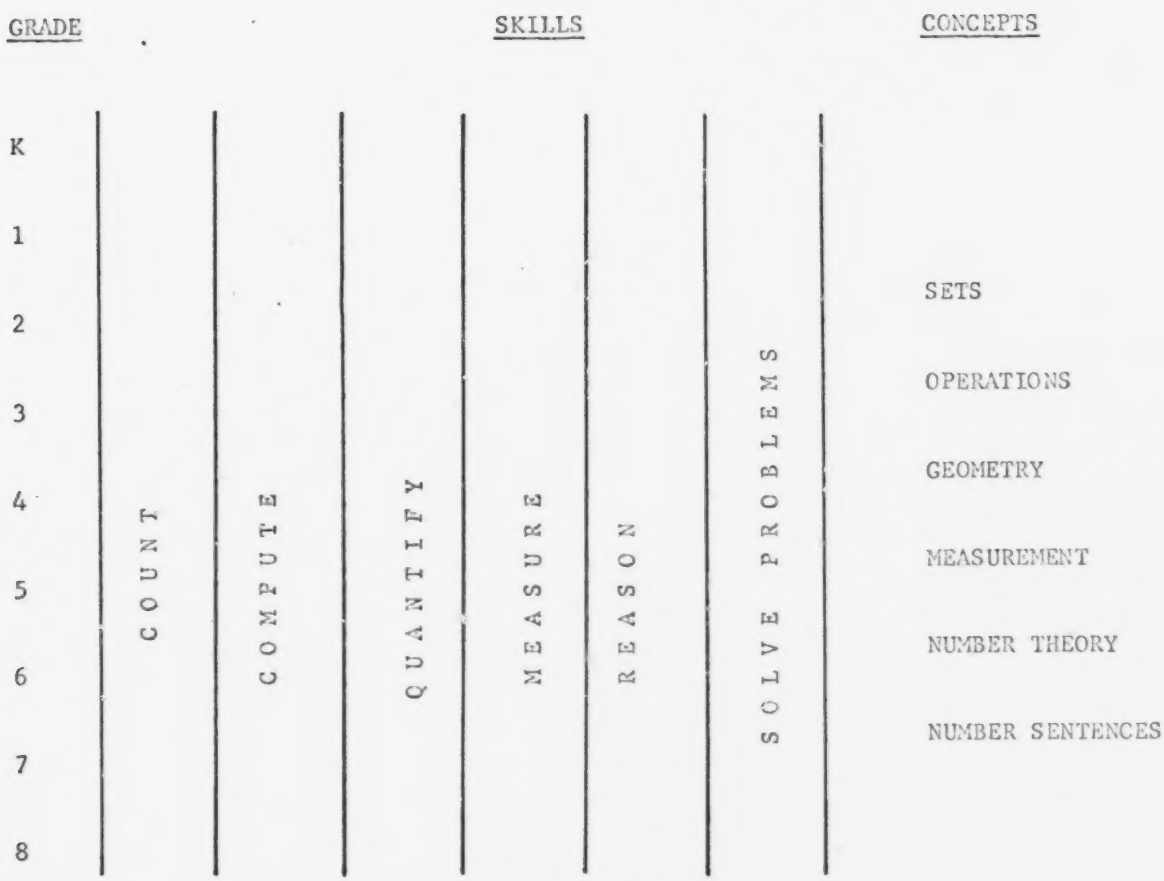
GOALS FOR MATHEMATICS PROGRAM

at

PUEBLO ELEMENTARY SCHOOL

The general goals for Pueblo Elementary School which were prepared by a committee of the Parent Council, contain such statements as developing the ability to reason and solve problems and developing the skills necessary to function well in society.

Each Pueblo Elementary School student should, at his own intellectual and maturational level, possess both problem solving and computational skills sufficient to enable him to function effectively in his day-to-day experiences as well as in the future.




As each concept is taught within each grade level, there is a spiraling of skills development commensurate with each student's ability at that level.

CONCEPT

SETS

KINDERGARTEN

Set recognition
Set comparison

1ST GRADE

Set membership
Set comparison
Set identification
- Equivalent, non-equivalent
Cardinal numbers
-through 6

2ND GRADE

Set comparison
Set membership
Set identification
- Equivalent, non-equivalent
Cardinal numbers
- through 10
Inequalities
Union-joining sets

3RD GRADE

Set comparison
Set description
Set identification
- Equivalent, non-equivalent
- subset
Cardinal numbers

4TH GRADE

Set description
Set identification
- Equivalent, non-equivalent
- Universal
Inequalities

5TH GRADE

Set identification
- subset
- superset
- universal
-symbols
Union, intersection
Cardinal number
-cross product

6TH GRADE

Set identification (recognition, description)
- subset, superset
- empty, universal (replacement)
- disjoint
- finite, infinite
-solution-equalities, inequalities
Cardinal numbers
- crossproduct
Union, intersection

7TH GRADE

Set description
- symbols $\in, \notin, \subset, \not\subset$
-proper, improper
-one-to-one correspondence

8TH GRADE

Set description
- symbols
- replacement
Set builder notation
Venn diagrams

CONCEPT

OPERATIONS

KINDERGARTEN

Addition
- properties
  - intuitive development
- joining sets
- combinations for 2 through 5

1ST GRADE

Addition
- joining sets
- symbolism
- 0 to 5
- 0 to 10
- missing addend 0 to 5
- missing addend 0 to 10
- three addends
- properties
  - zero as an identity element
  - associative
  - commutative
- story problems

Subtraction
- separating sets
- symbolism
-o to 5
-0 to 10
-missing numeral 0 to 5
-missing numeral 0 to 10
-story problems

Addition and subtraction
-0 to 10
- missing addend 0 to 10
- story problems

2ND GRADE

Addition
- joining sets
- terminology
- properties
  - associative
  - commutative
- 10 to 18
- equations-families of facts to 18
- two digit without regrouping
- two digit with regrouping
- three addends
- story problems

Subtraction
- separating sets
- terminology
- properties
  - non-commutative
  - non-associative
- 10 to 18
- dquations - families of facts to 18
- two digit without regrouping
- two digit with regrouping
- story problems

Addition and subtraction
- 0 to 10
- missing addend to 10
- 10 to 18
- two digit without regrouping
- two digit with regrouping
- three addends
- story problems

CONCEPT

OPERATIONS

3RD GRADE

Addition
-properties
 - associative
 - commutative
-symbols/terminology
 - equalities
 - inequalities
- two digit without & with regrouping
- three digit without & with regrouping
- with three or more addends
- facts to 18
- zero as a factor
- story problems

Subtraction
- properties
- two digit without & with regrouping
- three digit without & with regrouping
- with three or more numerals
- facts to 18
- zero as a factor
- story problems

Addition and subtraction
- inverse operations
- families of facts to 10
- add. & subt. of whole numbers to 3 or 4 place
- missing addend to 20
- missing subtrehend to 20
- story problems

Multiplication
- properties
  - associative
  - commutative
  - distributive
  - repeated addition
- symbols/terminology
- facts to 9 x 9
- mult. by 1 digit to 3 places
- mult. by 10, 100 & 1,000
- families of facts
- 0 in multiplication
- multiplicative identity of one
- story problems

CONCEPT

OPERATIONS

3RD GRADE (cont.)

Division
- properties
  - inverse operation of mult.
  - distributive
- symbols/terminology
- one digit divisor with no reaminder
- one digit divisor with a remainder
- one digit divisor with 2 digit quotient
- family of facts (division reverse of multiplication)
- story problems

Fractions
- recognition of fractional regions throught 10 parts
- addition with like denominators
- recognizing equivalents
- story problems

4TH GRADE

Addition
- number sentences - open and closed
- 3 digit without and with regrouping
- with 3 or more addends
- place value in addition
- story problems

Subtraction
- number sentences - open and closed
- 3 digit without and with regrouping
- with 3 or more numerals
- place value in subtraction -
- story problems

Addition-subtraction
- inverse operations
- whole numbers with 3 or more numbrals
- story problems

Multiplication
- properties
  - associative
  - commutative
  - distributive
  - repeated addition
- one factor, 2 digits
- one factor - 3 or more digits

two, 2 digit factors
- zero and one in multiplication
- one factor greater than 1000
- place value in multiplication
- story problems

Division
- properties
  - distributive
- two digit divisor w/o remainder
- two digit divisor with remainder
- story problems

Fractions
- properties
  - distributive
- equivalent fractions and regions
- subtraction-like denominators
- addition with unlike denominators
- subtraction " " "
- story problems

CONCEPT

OPERATIONS

5TH GRADE

Addition
-whole numbers greater than 10,000
- 2 and 3 place without and with regrouping
- 2 and 3 place with regrouping
- story problems
  - equations
  - denominate numbers

Subtraction
- whole numbers greater than 1,000
- 2 and 3 place without regrouping
- 2 and 3 place with regrouping
- story problems
  - equations
  - denominate numbers

Multiplication
- terminology
  - factors, product
- factors greater than 10 with multiples of 100
- multiplication with factors of 2 and 3 digits
- story problems
  - equations
  - denominate numbers

Division
- estimation of
  - quotients
  - remainders
- 2 digit divisor with remainders
-2 digit divisor with dividend of more than 3 digits
- story problems

Fractions
- equivalent - renaming
-addition, subtraction - like denominators
- addition, subtraction - unlike denominators
- multiplication
  - fraction x whole number
  - fraction x fraction
- improper fractions
- addition, subraction whole numbers and mixed fractions
- story problems

CONCEPT

OPERATIONS

6TH GRADE

Addition
- properties
  - associative
  - commutative
  - distributive

Subtraction
- properties
  - opposite of addition
  - non-cummutative

Multiplication
- properties
  - associative
  - commutative
  - distributive
- factors with 3 digits or more
- product estimation

Division
- properties
  - distributive
- 3 or more digit divisor w/o and with remainder
- estimation of
  - quotients
  - remainder

Fractions
- equivalent
- improper- number greater than 1
  - addition and subtraction
- addition, subtraction - unlike denominator
- addition, subtraction - both addends greater than 1
- multiplication
  - whole number x fraction
  - unit fraction x unit fraction
  - unit fraction x numbers greater than 1
  - greatest common factor
  - numbers greater than 1 x numbers greater than 1
- division
  - inverse operations
  - reciprocals
  - both factors greater than 1

Decimals
- addition through 100s
- subtraction through 100s
- multiplication through 100s
- division through 100s

Story Problems
- + whole numbers, fractions, decimals
- - whole numbers, fractions, decimals
- x whole numbers, fractions, decimals
- ÷ whole numbers, fractions, decimals
- two or more operations

CONCEPT

OPERATIONS

7TH GRADE

Rational numbers
--laws
- addition
  - properties
    - associative
    - commutative
  - addition algorithms
- subtraction
  - properties
  - algorithms
- multiplication
  - properties
    - commutative
    - associative
    - distributive
  - simplifying
  - properties of zero
  - properties of one
  - algorithm
- division
  - algorithm

Decimals
- place value
- addition, subtraction, multiplication, division algorithms
- renaming decimals and fractions

Intergers
- negative numbers
- positive numbers
- addition
- subtraction

Percentage
- ratio and proportion
- ratio and percent
- applications
- percents and graphs
  - statistics

8TH GRADE

Rational numbers
- comparison of
- addition
- subtraction
- multiplication
- division

Decimals
- renaming decimals for rational numbers
- repeating decimals

Real numbers
- irrational, rational

Integers
- addition
- subtraction
- multiplication
- division

CONCEPT

NUMBER THEORY

KINDERGARTEN

Cardinal numbers
Rote counting 0 to 10
Order 0 to 10
Writing numerals 0 to 10

GRADE 1

Notation
- writing 0 to 10
- writing 0 to 100
- sequencing
- skip counting through 2's and 5's
- zero

Place Value
- ones, tens
- number line
- expanded notation

Order
- inequalities, equalities
- symbols
- before, after, between
- many names - same numbers

Odd and even numbers

GRADE 2

Notation
- writing 100 to 1000
- sequencing
- skip counting 10's to 100
- zero
- one

Place Value
-100's
- number line
- expanded notation

Order
- inequalities, equalities
  - symbols
- different names/same numbers
- ordinal numbers to 10's

Odd/even numbers.

CONCEPT

NUMBER THEORY

GRADE 3

Notation
- recognize and write 10 through 99
- recognize and write numbers less than 1000
- odd and even
- multiples to 100
- before, after, between
- number patterns
- skip counting through the 8"s

Place Value
- two digit 10's and 1's
- three digits 1000's 100's 10's and 1's
- expanded notation - 100's

Order
- ordinal numbers to 100's
- counting/sequencing

Prime Numbers

Identity element of 0, 1

Factors

Symbols
- when to use, - addition, subtraction, multiplication, division, greater than, less than, and equal to, symbols

GRADE 4

Notation
- recognize and write numbers greater than 1000
- recognize and write primes and composites
- number patterns - order
- Roman numerals
- exponential
- recognize and write inequlities

Place Value
- three digits 1000's, 100's , 10's and 1's
- expanded notation
- Base 8

Factors
- common
- greatest common
- prime numbers

Multiples
- common
  - least

Estimation of whole numbers

CONCEPT

NUMBER THEORY

GRADE 5

Notation
- numbers greater than 1000
- prime and composite numbers
- sequence- patterns
- exponential
- squaring
- percents

Place Value
- 3 or more digits
- Base 5

Factors
- common
-greatest
- prime

Multiples
- common
- least, greatest

Estimation of whole numbers
- addition, subtraction

Ratio
- scale drawings

CONCEPT

NUMBER THEORY

GRADE 6

Notation
- prime and composite numbers
- Roman numerals
- scientific
  - exponents
  - squaring
- percents

Place Value
- Base 2

Factors
- common
- greatest
- prime

Multiples
- common
- least, greatest

Estimation of whole numbers
- multiplication, division

Ration and Proportion
- comparisons

Integers
- number line

Rational numbers
- number line

Percents
- decimal fractions to 100's
- decimal fractions to 1000's

Probability
- occurance
- independent

CONCEPT

NUMBER THEORY

GRADE 7

Notation
- prime and composite numbers
  - relatively prime numbers
  - perfect numbers
Place Value
- Base 2, 3, 12
- exponents
- powers
- squares
- square roots
- decimals
Factors
- prime numbers
Multiples
- divisibility tests
Statistics
-frequency distribution
- graphs
Real numbers
- number line

GRADE 8

Place Value
- scientific notation
  - product, quotients
- exponents
  - zero
  - negative
- square roots
  - estimation
  - rational approximations
Integers
- number line
Rational numbers
- absolute value
- comparing
Probability
- occurance of events
- combined events
- empirical
- random sampling
- predictions
Real Numbers
- comparing
- completeness property
Estimation
- slide rule

CONCEPT

MEASUREMENT

KINDERGARTEN

Comparison other than shape and number
- larger/smaller
  - length
  - height
  - weight
  - inside/outside
  - time
    - calendar

1ST GRADE

Money
- 1 cent to 1 dime

Time
- hour, half-hour, quarter-hour
- day, week, month, year

Linear
- inch
- half-inch

Capacity
- cup, pint, quart

2ND GRADE

Money
- recognizing coins
- 1 cent to 1 dollar
- making change to one dollar

Time
- measuring
- half-hour, hour
- 1 day to 1 year
- calendar

Linear
- measuring
- inch, foot

3RD GRADE

Money
- recognize U.S. currency
- make change to $5.00

Time
- telling time
- calendar - day through year

Linear
- English ruler to ½"
- foot and yard

Capacity
- equivalent amounts in American system

Weights
- equivalent amounts in American system

Graphs
- bar
- interpretation

4TH GRADE

Linear
- measuring
- area

Capacity
- Measuring equivalent amount in American system
- volume

Weight
- measuring equivalent amounts in American system

Graphs
- number plane
- data
- graphing
- bar graphs
- average

Temperature
- Faharenheit degree

Systems of Measurement
- English
- Metric

CONCEPT

MEASUREMENT

5TH GRADE

Money
- addition, subtraction
- multiplication

Time
- second, year, century
- conversion within American system

Linear
- conversion within American system
  - area
    - formulas and measuring

Weight
- conversion within American system

Capacity
- ounce
- conversion within American system
- volume
  - formulas and measuring

Graphs
- bar
- line
- tables of data
  - formulation
  - interpretation
- construction
- average
- ordered pairs

Metric
- recognition

6TH GRADE

Money
- division

Time
- International
- latitude-longitude

Linear
- conversion within American system
- area, surface area

Weight
- conversion within American system

Capacity
- conversion
- volume

Graphs
- double bar graphs
- range, average, mode, median
- construction
  - ordered pairs
  - coordinate system
  - symmetry

Metric
- recognition
- conversion within Metric system

7TH GRADE

Linear
- conversion within American system
- perimeter

Weight
- conversion within American system

Capacity
- conversion within American system

Graphs
- line
- range, average, median, mode
- interpretation

Metric
- conversion within and outside the system

Precision accuracy

Areas
- lateral
- metric areas

8TH GRADE

Capacity
- volume

Metric
- conversion of
  - linear units
  - area
  - volume

Graphs
- rectangular coordinate systems
- linear functions
- linear inequalities

Precision
- greatest possible error

Accuracy
- relative error

CONCEPT

GEOMETRY

KINDERGARTEN

Comparison of shape
Comparison of size
- Recognition of a closed curve
- Rectangular regions
- Triangular regions
- Square

1ST GRADE

Identification of shapes
Naming regions
- partial regions - one-half, one-quarter
Line segments

2ND GRADE

Simple closed curves
Naming Regions
- partional regions, - halves, quarters, thirds
 - areas
Line segments
=properties
-measurement

3RD GRADE

Simple closed curves
- identification
  - circle, square, triangle, rectangle
- construction
  - protractor
  - compass
Regions
- identification - circular, square, rectangular, rectangular
- measurement
-areas
Line segments
- points, end points
- rays
- planes, space
Angles
=identification
Symmetry
- figures
- parallel

CONCEPT

GEOMETRY (cont.)

4TH GRADE

Simple closed curves
- identification
  - polygons, pyramid, cone, sphere, cube, cylinder, quakrilateral, parallelogram, ellipse

Planes
- identification
- properties
- number planes
  - data
  - graphing

Angles
- identification
- right angle
- perpendicular

Symmetry
- paralles
- congruence

Circles
- diameter, radius

Measurement of geometric figures
- length
- perimeter
- area

Volume
- identification by shape

CONCEPT

GEOMETRY

5TH GRADE

Points, lines, curves, line segments, rays, planes
- properties
- measuring
Shapes - polygon
- recognition
- definition
- construction
Angles
- identification
- right angle
- perpendicular
- definition
- properties
-measuring
- construction
Closed surfaces
- properties of polyhedrons
Circles
- arc, chord
- construction
Ellipse
- properties
Measurement
- perimeter
- area
  -formula
- volume
  -formula
- surface area
Similarity - congruence

CONCEPT

GEOMETRY

6TH GRADE

Points and Lines in a Plane
- properties
- relationships
- construction
- intersections

Shapes
- properties

Polygons
- properties
- construction
- measurement

Angles
- construction
- measuring
  - protractor
- right angle
- perpendicular
- linear pairs
- bisector

Closed surfaces
- characteristics
- intersections

Circles
- circumference
- area

Ellipse

Triangles
- right, isoceles, equilateral
- construction
- ratio
- Pythagorean Theorem

Measurement
- area
- surface area
- volume
  - formula

Similarity-congruence

Symmetry

CONCEPT

GEOMETRY

7TH GRADE

Figures in Space
- points
- lines
-planes
Intersections in Space
 - lines and planes
Lines, points, planes
- co-linear
- co-planer
- co-incident
- concurrent
Angles
- straight
- vertical
- congru ent
Measurement-Construction
- segments
  -length
- polygons
  -perimeter
- angles
  -supplementary, complementary
- regions in a plane
  - triangles
  - quadrilaterals
  - circles
- regions in space
  - right angles
  - rectangular prisms
Similarity - Congruence
Symmetry

CONCEPT

GEOMETRY

8TH GRADE

Figures in Space
- points
- lines
- planes
- tetrahedron and other pyramids
- prisms
- cones, cylinders
- sphers
- circles

Measurement - Construction
- segments
  - length
- polygons
  - perimeter, area
- angles
  - parallel, perpendicular
- triangles
  - Pythagorean Theorem
  - right triangles
- prisms
  - surface area, volume
- pyramids
  - surface area, volume
- cones, cylinders, spheres
  - surface area, volumes
- circles
  - area, circumference

Similarity - Congruence
- recognition of figures
- properties
- construction

Symmetry
- line
- axis

CONCEPT

NUMBER SENTENCES

KINDERGARTEN

Equalities/inequalities
- comparison

Sequence pictures

1ST GRADE

Equalities/inequalities
- comparisons

Symbols in number sentences
- $<, >, =, +, -$

Families of facts

Measurement
- liquid
- money

Story Problems
- verbal, written
- completing picture problems

2ND GRADE

Equalities/inequalities

Symbols
- $<, >, =, +, -$

Measuremnnt
- liquid
- money

Story problems
- verbal, written
- writing from picture problems

3RD GRADE

Symbols in number sentences
- $+, -, \times, \div, <, >, =$

Measurement
- liquid
- money
- linear
- rates
- time

Parentheses
- associativity
- grouping

Story Problems

4TH GRADE

Symbols
- $+, -, \times, \div, >, <, =, \neq$

Measurement
- money
- linear
- rates
- volume
- metric

Story Problems
- developing equations
- fractions
- 2 or more variables

Logic
- quantifiers
- conditionals

5TH GRADE

Symbols
- $+, -, \times, \div, <, >, =, \neq$
- unknowns

Measurement
- money
- linear
- rates
- capacity
- metric
- weights

Story Problems
- developing equations
- fractions
- exponents
- 2 or more variables

Logic
- quantifiers
- conditionals
- negating statements

CONCEPT

NUMBER SENTENCES

6TH GRADE

Symbols
- $+, -, \times, \div, <, >, =, \neq$
- unknowns

Measurement
- metric
- statistics

Story Problems
- developing equations
- developing inequalities
- exponents
- decimals
- 2 or more variables

Logic
- quantifiers
- conditionals
- negating statements

7TH GRADE

Equations, inequalities

Measurement

Equations into variables

Quantifiers

Logic
- compound statements

8TH GRADE

Equations, inequalities, phrases, statements

Equations into variables
- powers

English sentences to number sentences

Systems of linear equations
- graphing
- solution

Step-by-step problem solving procedures

Logic
- biconditionals
- syllogistic deduction

COMMONALITY

| MATH CONCEPT | SCIENCE CONCEPT | PROCESS |
|---|---|---|
| MEASUREMENT | 5,6,7,8,9,10,11,12,13 | a - h |
| SETS | 1,3,4,7,12 | a - h |
| OPERATIONS | 1,2,4,5,6,7,8,9-13 | a - h |
| NUMBER THEORY | 1 - 13 | a - h |
| GEOMETRY | 7,9,10,13 | a - h |
| NUMBER SENTENCES | 1 - 13 | a - h |

# REPRESENTATIVE MATHEMATICS UNITS

# CODED TO

# MATHEMATICS SCOPE AND SEQUENCE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III


Developed by:

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Curriculum Leader

Mary Lou Nevin, 1-2
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## MATHEMATICS CODING SCHEME

Column 1 Subject area identification

| | |
|---|---|
| LA | Language Arts |
| MA | Mathematics |
| SC | Science |
| SS | Social Studies |
| AR | Art |
| VM | Vocal Music |
| IM | Instrumental Music |
| PE | Physical Education |

Column 2 Grade level designation

| | |
|---|---|
| 0 | Kindergarten |
| 1 | First grade |
| 2 | Second grade |
| 3 | Third grade |
| 4 | Fourth grade |
| 5 | Fifth grade |
| 6 | Sixth grade |
| 7 | Seventh grade |
| 8 | Eighth grade |

Column 3 Major Concepts*

| | |
|---|---|
| S | Sets |
| O | Operations |
| NT | Number Theory |
| M | Measurement |
| G | Geometry |
| NS | Number Sentences |

NOTE: An X means all categories in that column are included.

*Please note that in the math coding scheme each item of Column 3 has a separate coding for Columns 4 and 5. These are listed on the following pages.

SETS*

COLUMN 4

1. Set recognition
2. Set membership
3. Set comparison
4. Set identification
5. Cardinal numbers
6. Inequalities
7. Union, intersection
8. Set description
9. Set builder notation
10. Venn diagrams

| COLUMN 4 | COLUMN 5 |
|---|---|
| 1. | ---- |
| 2. | ---- |
| 3. | ---- |
| 4. | a. equivalent, non-equivalent |
| 4. | b. subset |
| 4. | c. empty |
| 4. | d. universal |
| 4. | e. superset |
| 4. | f. symbols |
| 4. | g. disjoint |
| 4. | h. finite, infinite |
| 4. | i. solution |
| 5. | a. through 6 |
| 5. | b. through 10 |
| 5. | c. cross product |
| 6. | |
| 7. | |
| 8. | a. symbols $\in, \notin, \subset, \not\subset, \emptyset$ |
| 8. | b. proper, improper |
| 8. | c. one-to-one correspondence |
| 8. | d. replacement |
| 9. | |
| 10. | |

*In the math coding scheme each section of Column 3 has a separate coding for Column 4 and 5.

OPERATIONS

COLUMN 4

1. Addition
2. Subtraction
3. Addition and Subtraction
4. Multiplication
5. Division
6. Fractions
7. Decimals
8. Story problems
9. Rational numbers
10. Integers
11. Percentage
12. Real numbers

COLUMN 5

1. a. properties
   b. joining sets
   c. combinations for 2 through 5
   d. terminolohy/symbols
   e. 0 to 5
   f. 0 to 10
   g. missing addend 0 to 5
   h. missing addend 0 to 10
   i. 10 to 18
   j. equations - families of facts to 18
   k. 2 digit without regrouping
   l. 2 digit with regrouping
   m. 3 addends
   n. story problems
   0. 3 digit w/o and with regrouping
   p. with 3 or more addends
   q. zero as a factor
   r. number sentences - open and closed

2. a. separating sets
   b. combination for 2 through 5
   c. symbolism/terminology
   d. 0 to 5
   e. 0 to 10
   f. missing numeral 0 to 5
   g. missing numeral 0 to 10
   h. story problems
   i. properties
   j. 10 to 18
   k. equations families of facts to 18
   l. two digit without regrouping
   m. two digit with regrouping
   n. 3 digit without and with regrouping
   o. with 3 or more numerals
   p. zero as a factor
   q. number sentences - open and closed
   r. place value in subtraction
   s. whole numbers greater than 1000

OPERATIONS (cont.)

COLUMN 5

3. a. 0 to 10
   b. missing addend 0 to 10
   c. story problems
   d. 10 to 18
   e. 2 digit without regrouping
   f. 2 digit with regrouping
   g. three addends
   h. story problems
   i. inverse operations
   j. families of facts to 10
   k. addition and subtraction of whole numbers to 3 or 4 place
   l. column addition to 3 or 4 place
   m. missing addend to 20
   n. missing subtrahend to 20

4. a. properties
   b. symbols/terminology
   c. facts to 9 x 9
   d. multiplication by 1 digit to 3 places
   e. multiplication by 10, 100, and 1000
   f. families of facts
   g. 0 in multiplication
   h. multiplicative identity of one
   i. story problems
   j. one factor, 2 digits
   k. one factor, 3 or more digits
   l. 2, 2 digit factors
   m. one factor greater than 1000
   n. place value in multiplication
   o. factors greater than 10 with multiples of 100
   p. multiplication with factors of 2 and 3 digits
   q. factors with 3 digits or more
   r. product estimation

5. a. properties
   b. symbols/terminology
   c. one digit division with no remainder
   d. one digit division with a remainder
   e. one digit division with 2 digit quotient
   f. family of facts (division reverse of multiplication
   g. story problems
   h. 2 digit divisor without remainder
   i. 2 digit divisor witha remainder
   j. estimation
   k. 2 digit divisor with divident of more than 3 digits
   l. 3 or more digit divisor without and with a remainder.

OPERATIONS (cont.)

COLUMN 5

6. a. recognition of faactional regions throught 10 parts
   b. addition with like denominators
   c. recognizing equivalents
   d. story problems
   e. properties
   f. equivalent fractions and regions
   g. subtraction - like denominators
   h. addition with unlike denominators
   i. subtraction with unlike denominators
   j. equivalent - renaming
   k. multiplication
   l. improper fractions
   m. addition, subtraction - whole numbers and mixed fractions
   n. addition , subtraction both addends greater than 1
   o. division

7. a. addition through 100's
   b. subtraction through 100's
   c. multiplication through 100's
   d. division through 100's
   e. place value
   f. addition, subtraction, multiplication, division algorithms
   g. renamin decimals and fractions
   h. renaming decimals for rational numbers
   i. repeating decimals

8. a. addition whole numbers, fractions, decimals
   b. subtraction whole numbers, fractions, decimals
   c. multiplication, whole numbers, fractions, decimals
   d. division whole numbers, fractions, decimals
   e. 2 or more operations

9. a. laws
   b. addition
   c. subtraction
   d. multiplication
   e. division
   f. comparison

10. a. negative numbers
    b. positive numbers
    c. addition
    d. subtraction
    e. multiplication
    f. division

11. a. ration and proportion
    b. ratio and percent
    c. applications
    d. percents and graphs

12. a. irrational, rational

OPERATIONS

COLUMN 6.

1. a. 1. intuitive development
   2. zero as an identity element
   3. associative
   4. commutative

   d. 1. equalities
   2. inequalities

   n. 1. equations
   2. denominate numbers

2. h. 1. equations
   2. denominate numbers

   i. 1. non-commutative
   2. non-associative
   3. opposite of addition

3. _____

4. a. 1. associative
   2. commutative
   3. distributive
   4. repeated addition

   b. 1. factors, product

   i. 1. equations, denominate numbers

5. a. 1. inverse operation of multiplication
   2. distributive

   j. 1. quotients
   2. remainders

6. e. 1. distributive

   k. 1. fraction x whole number
   2. fraction x fraction
   3. unit fraction x unit fraction
   4. unit fraction x numbers greater than 1
   5. greatest common factor
   6. numbers greater than 1 x numbers greater than 1

   1. 1. 1 addition and subtraction

   o. 1. 1 inverse operations ($a \times \frac{1}{N} = a \div N$)
   2. reciprocals

   e. 1. both factors greater than 1

7. _____



8. _____

OPERATIONS

COLUMN 6

9. b. 1. properties
2. algorithms
c. 1. properties
2. algorithms
d. 1. properties
2. simplifying
3. properties of zero
4. properties of one
5. algorithms
e. 1. algorithm

10. _____

11. d. 1. statistics

12. _____

COLUMN 7

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. b. 1. a. associative
b. commutative
d. 1. a. associative
b. commutative
c. distributive

NUMBER THEORY

COLUMN 4

1. Cardinal numbers
2. Rote counting 0 to 10
3. Order
4. Writing numerals
5. Odd and even numbers
6. Notation
7. Place Value
8. Prime numbers
9. Identity element of zero, one
10. Factors
11. Symbols
12. Multiples
13. Estimation of whole numbers
14. Ratio and proportion
15. Integers
16. Rational numbers
17. Percents
18. Probability
19. Statistics
20. Real numbers

COLUMN 5

1. _____
2. _____
3. a. inequalities, equalities
   b. before, after, between
   c. many names - same number
   d. ordinal numbers
   e. counting, sequencing
4. _____
5. _____
6. a. writing numerals 0 to 10
   b. writing numerals 0 to 100
   c. sequencing
   d. skip counting through 2's, 5's
   e. zero
   f. writing 100 to 1000
   g. skip counting 10's to 100
   h. one
   i. recognize and write 10 through 99
   j. recognize and write numbers less than 1000
   k. odd and even
   l. multiples of 100
   m. before, after, between
   n. number patterns
   o. skip counting through the 8's
   p. recognize and write numbers greater than 1000
   q. recognize and write primes and composites
   r. Roman numerals
   s. exponential
   t. recognize and write inequalities
   u. squaring
   v. scientific
   w. percents

NUMBER THEORY

COLUMN 5

7. a. ones, tens
   b. number line
   c. expanded notation
   d. 100's
   e. two digit 10's and 1's
   f. three digit 1000's, 100's, 10's and 1's
   g. base 8
   h. 3 or more digits
   i. base 5
   j. base 2
   k. base 3, 12
   l. exponents
   m. powers
   n. squares
   o. square roots
   p. decimals
   q. scientific notation
8. _____
9. _____
10. a. common
    b. greatest common
    c. prime numbers
11. a. when to use
12. a. common
    b. least, greatest
    c. divisibility test
13. a. addition, subtraction
    b. multiplication, division
    c. slide rule
14. a. scale drawings
    b. comparisons
15. a. number line
16. a. number line
    b. absolute value
    c. comparing
17. a. decimal fractions to 100's
    b. decimal fractions to 1000's
18. a. occurance
    b. independent
    c. combined events
    d. empirical
    e. random sampling
    f. predictions
19. a. frequency distribution
    b. graphs
20. a. number lines
    b. comparing
    c. completeness property

COLUMN 6

1. _____
2. _____
3. a. 1. symbols
4. _____
5. _____
6. q. 1. relatively prime numbers
   2. perfect numbers
   v. 1. exponents
   2. squaring
7. 1. 1. zero
   2. negative
   0. 1. estimation
   2. rational approximations
   q. 1. product, quotient
8. _____
9. _____
10. _____
11. _____
12. a. 1. least
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

MEASUREMENT*

COLUMN 4

1. Comparisons other than shape and number
2. Money
3. Time
4. Linear
5. Capacity
6. Weight
7. Graphs
8. Temperature
9. Systems of Measurement
10. Metric
11. Precision - accuracy
12. Areas
13. Precision
14. Accuracy

COLUMN 5

1. a. larger/smaller
2. a. 1 cent to 1 dime
   b. recognizing coins
   c. 1 cent to 1 dollar
   d. making change to one dollar
   e. recognize U.S. currency
   f. make change to $5.00
   g. addition, subtraction
   h. multiplication
   i. division
3. a. hour, half-hour, quarter-hour
   b. day, week, month, year
   c. measuring
   d. 1 day to 1 year
   e. calendar
   f. telling time
   g. second, year, century
   h. conversion within American system
   i. International
   j. latitude-longtitude
4. a. inch
   b. half-inch
   c. measuring
   d. English ruler to ¼"
   e. foot and yard
   f. area
   g. conversion within American system
   h. surface area
5. a. cup, pint, quart
   b. equivalent amounts in American system
   c. volume
   d. ounce
6. a. equivalent amounts in American system
   b. measuring equivalent amounts in American system
   c. conversion within American system
7. a. bar
   b. number plane
   c. data
   d. graphing
   e. average
   f. line
   g. table of data
   h. construction
   i. ordered pairs
   j. double bar graphs
   k. range, average, mode, median
   l. interpretation
   m. rectangular coordinate systems
   n. linear functions
   o. linear inequalities
8. a. Faharenheit degree
9. a. English
   b. Metric
10. a. recognition
    b. conversion within American system
    c. conversion outside the system
11. _____
12. a. lateral
    b. metric areas
13. a. greatest possible error
14. a. relative error

*Please note that in the math coding scheme each section of Column 3 has a separate coding for Columns 4 and 5.

MEASUREMENT*

COLUMN 5

1. a. 1. length
   2. height
   3. weight
   4. inside/outside
   5. time
2. _____
3. _____
4. f. 1. formulas and measuring
5. c. 1. formulas and measuring
6. _____
7. a. 1. interpretation
   g. 1. formulation
      2. interpretation
   h. 1. ordered pairs
      2. coordinate system
      3. symmetry
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

COLUMN 6

1. a.r.a. calendar
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

GEOMETRY*

COLUMN 4

1. Comparison of Shape
2. Comparison of Size
3. Recognition
4. Identification
5. Naming regions
6. Line segments
7. Simple closed curves
8. Regions
9. Angles
10. Symmetry
11. Planes
12. Circles
13. Measurement of geometric figures
14. Volumne
15. Points
16. Polygons
17. Closed surfaces
18. Ellipse
19. Similarity - congruence
20. Points and Lines in a plane
21. Shapes
22. Triangles
23. Figures in space
24. Intersections in space
25. Construction

*In the math coding scheme each section of Column 3 has a separate coding for Columns 4 and 5.

GEOMETRY*

COLUMN 5

1. ____
2. ____
3. a. closed curve
   b. rectangular regions
   c. triangular regions
   d. square
4. ____
5. a. partial regions
   b. areas
6. a. properties
   b. measurement
   c. points, end points
   d. rays
   e. planes, space
   f. co-linear
   g. co-planer
   h. co-incident
   i. concurrent
7. a. identification
   b. construction
8. a. identification
   b. measurement
   c. areas
9. a. identification
   b. right angle
   c. perpendicular
   d. definition
   e. properties
   f. measuring
   g. construction
   h. linear pairs
   i. bisector
   j. straight
   k. vertical
   l. congruent
10. a. figures
    b. parallel
    c. congruence
    d. line
    e. axis
11. a. identification
    b. properties
    c. number planes
    c. co-linear
    e. co-planar
    f. co-incident
    g. concurrent
12. a. diameter, radius
    b. arc, chord
    c. construction
    d. circumference
    e. area
13. a. length
    b. perimeter
    c. area
    d. volume
    e. surface area
14. a. identification by shape
15. a. properties
    b. measuring
    c. co-linear
    d. co-planer
    e. co-incident
    f. concurrent
16. a. properties
    b. construction
    d. measurement
17. a. properties of polyhedrons
    b. characteristics
    c. intersections
18. a. properties
19. a. recognition of figures
    b. properties
    c. construction
20. a. properties
    b. relationships
    c. construction
    d. intersection
21. a. recognition
    b. definition
    c. construction
    d. properties
22. a. right, isoceles, equilateral
    b. construction
    c. ratio
    d. Pythoagorean Theorem
23. a. points
    b. lines
    c. planes
    d. tetrahedron and other pyramids
    e. prisms
    f. cones, cylinders
    g. spheres
    h. circles
24. a. lines and planes
25. a. segments
    b. polygons
    c. angles
    d. regions in a plane
    e. regions in space
    f. triangles
    g. prisms
    h. pyramids
    i. cones, cylinders, spheres
    j. circles

*In the math coding scheme each section of Column 3 has a separate coding for Columns 4 and 5.

GEOMETRY*

COLUMN 6

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. a. 1. circle, square, triangle, rectangle
   b. 1. protractor
      2. compass
8. _____
9. f. 1. protractor
10. _____
11. c. 1. data
       2. graphing
12. _____
13. c. 1. formula
    d. 1. formula
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. a. 1. length
    b. 1. perimeter, area
    c. 1. supplementary, complementary
       2. parallel, perpendicular
    d. 1. triangles
       2. quadrilaterals
       3. circles
    e. 1. right angles
       2. rectangular prisms
    f. 1. Pythagorean Theorem
       2. right traiangles
    g. 1. surface area, volume
    h. 1. surface area, volume
    i. 1. surface area, volume
    j. 1. area, circumference

*In the math coding scheme each section of Column 3 has a separate coding for Columns 4 and 5.

NUMBER SENTENCES*

COLUMN 4

1. Equalities/inequalities
2. Sequence pictures
3. Symbols in number sentences
4. Families of facts
5. Measurement
6. Story problems
7. Parentheses
8. Logic
9. Quantifiers
10. Equations into variables
11. Equations, inequalities, phrases, statements
12. English sentences to number sentences
13. Systems of linear equations
14. Step-by-step problem solving procedures

9. _____
10. a. powers
11. _____
12. _____
13. a. graphing
    b. solution
14. _____

COLUMN 5

1. a. comparison
2. _____
3. a. $>, <, =, +, -, \times, \div, \neq$
4. _____
5. a. liquid
   b. money
   c. linear
   d. rates
   e. time
   f. volume
   g. metric
   h. capacity
   i. weights
   j. statistics
6. a. verbal, written
   b. completing picture problems
   c. writing from picture problems
   d. dev loping equations
   e. fractions
   f. 2 or more variables
   g. exponents
   h. developing inequalities
   i. decimals
7. a. associativity
   b. grouping
8. a. quantifiers
   b. conditionals
   c. negating statements
   d. compound statements
   e. biconditionals
   f. syllogistic deduction

## INSTRUCTIONAL UNITS

As instructional units are prepared for the concepts within the Mathematics Scope and Sequence they will all follow a similar format. Those that exist at present will be revised.

Each unit will be titled from the Scope and Sequence chart with the concept and subconcept to which it refers. Performance objectives will be stated. Any pertinent teacher information regarding content will be included but under separate cover. Either a pre-test or information regarding the retrieval of one will be included. An outline of the content, a list of the various learning activities, directions for their use, and resource materials will be identified. Finally, the post-test or other appropriate evaluation procedure will be included.

All units will be coded from the scope and sequence code for easy retrieval. Manipulative games and enrichment materials will also be coded and stored in a central location.

E. C. E. UNITS OF INSTRUCTION

# STAFF UTILIZATION FOR CONTINUOUS PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Geraldine Clifford
Jane Froment

## COMPARISON AND IDENTIFICATION OF SHAPES

GOALS: Introduce geometric shape and some of their specific properties.
Comparison of triangle, circle, oval by shape.
Comparison of specific shapes by size.

OBJECTIVES: When given different geometric shapes child will be able to identify and name triangle, square, circle, oval and rectangle.

When given a geometric shape, the child will be able to compare size of shape from smallest to largest.

When given different geometric shapes, the child will be able to identify those of same shape.

MATERIALS: Individual folders with objects made from specific shapes.

Bingo game - a game for children.

Tactile geometric shapes.

Large charts with comparison of shapes.

EVALUATION: When shown a specific shape child will be able to name shape and identify simple properties.

## MANIPULATIVE MATH KIT

GOAL: To develop various mathmatical concepts to be determined by the unit of instruction.

OBJECTIVES:

1. Given a collection of felt objects the child will be able to identify a set as a collection or a group of things.

2. Given different sets of felt objects the child will be able to compare sets that are more, less and equal.

3. Given different sets of felt objects the child will be able to explore the idea that the joining of two sets results in a new set with more elements.

4. Given a set of objects the child will be able to count the elements in a set.

5. Given a set of objects the child will be able to explore a one-to-one correspondence.

6. Given a circle, square, and triangle the child will be able to identify geometric figures.

7. Given a circle, square, and triangle the child will be able to compare geometric figures.

8. Using different manipulative materials such as: yarn, toothpicks, the child will be able to identify lines and line segments.

9. Using different manipulative materials such as: yarn and toothpicks the child will be able to identify simple closed and open curves.

10. Given different materials the child will be able to compare size such as: long-short, large-small.

MATERIALS TO BE USED:

felt board
pieces of felt
toothpicks
crayon
writing surface
manipulative felt materials in a circle, square andrectangle.
pieces of yarn

EVALUATION: Observation by teacher of correct verbal and manipulative response when using kits.

## MANIPULATIVE BIG BOOK

GOALS: Provide opportunity to identify sets and their properties.
Provide opportunity to identify sets 0 to 10.
Provide experiences in counting as a means of identifying a set.
Introduce numerals 0 to 10.
Provide opportunity for identification of numerals as a property of a set and tells how many.
Provide kinesthetic and tactile experience for writing numerals.
Provide opportunity to practive forming and writing numerals.

OBJECTIVES: Given a set of objects the child will count objects and identify how many elements in a set.
Given a set and numeral, the child will identify numeral as a symbol tellinghow many elements in a set.
After identification of set and corresponding number the child will be able to identify it.
Given tactile numerals the child will be able to trace over numeral with finger in preparation for writing it.
Given a numeral, the child will copy and write it in appropriate places in big book.
Given a number, the child will draw a set equal to that number.

MATERIALS: Crayon, writing surface, set of objects for each numeral, tactile numeral in big book, child's finger or hand.

EVALUATION: When shown numeral the child will be able to verbally identify it with 100% accuracy.

When given a set of given amount, the child will be able to identify amount with 100% accuracy.

When given crayon and paper on writing surface, child will be able to write numeral correctly with 80% accuracy.

## TACTILE BIG BOOK

GOALS: Provide opportunity to identify sets 1 - 5.
Provide experiences in counting as a mean of identifying a set.
Introduce numerals 1 - 5.
Provide kinesthetic and tactile experience for numerals 1 - 5.

OBJECTIVES: Given a set of objects the child will count objects and identify how many elements in a set.
Given a set and numeral the child will identify numeral as a symbol telling how many elements in a set.
After identification of set and corresponding numeral the child will be able to identify it.
Given tactile numerals the child will trace over numeral with finger in preparation for writing it.

MATERIALS: Tactile numeral in big book, child's finger or hand.

EVALUATION: When shown numeral the child will be able to verbally identify it with 100% accuracy.
When given a set of given amount, the child will be able to identify amount with 100% accuracy.

CODE: MA-1-X-X-x
MA-2-X-X-x

# MATHEMATICS

## EXEMPLARY UNIT FOR LEVELS 1 and 2

## ENRICHMENT ACTIVITIES

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Mary Lou Nevin

Raymond Brie

## GOING FISHING

GOAL: Review numerals.

OBJECTIVE: The child will be able to identify numerals.

MATERIALS: Fish pole with magnets.
Container used as fish bowl.
Fish with numerals written on them.
Paper clips in fish mouth.

EVALUATION: Child will see numeral and then name it.

## CONCENTRATION GAMES

GOALS: To provide experience to match sets which are equal.
To provide opportunity to match numeral which are the same.
To provide practice in visual memory skills.

OBJECTIVES: When given set of cards with different sets, the child will be able to compare sets and find the sets which are equal.
When given set of cards with different numerals the child will be able to compare numerals and find the one which are the same.

MATERIALS: Cards with sets and numerals.

EVALUSTION: When given a set of cards with different set of objects the child will be able to match equal sets with 100% accuracy.
When given a set of cards with different sets of numerals the child will be able to match equal numerals with 100% accuracy.

CODE: MA-1-X-X-x
MA-2-X-X-x

# MATHEMATICS

## EXEMPLARY UNIT FOR LEVELS 1 and 2

## ENRICHMENT ACTIVITIES

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Mary Lou Nevin

Raymond Brie

## INSTRUCTIONAL UNIT

1-2

Objective:

The purpose of this instructional unit is to provide enrichment activities for children in the 1-2 L.C. Each major heading under the scope and sequence has supportive materials.

Activities:

There are three major activities for individual reinforcement, remediation or enrichment activities.

1. Concept coded individual activity cards.
2. Fraction bowls for manipulative regions of fractional regions. (1/2, 1/3, 1/4, 1/5, 1/8, 1/16)
3. Spinners for random selection of addends, subtrahends, minuends and place value.

Materials:

Concept coded individual activity cards were constructed in 11 different colors of bristol board cut to 8 1/2 by 11 inches. Selected work pages were added and covered with clear contact. This will enable the student to use crayons or china markers to make the materials reuseable.

Fraction bowls were constructed from plastic bowls and bristol board. The lids were used for patterns of 1/2, 1/3, 1/4, 1/5, 1/8, and 1/16. The fractions will fit into the lids.

Small plastic bowl with spinners on the lids. The spinner is made out of oak tag with numbers from 0-9 on top and covered with clear contact. The spinner is made from bristol board and fastened to the spinners with a brad.

Evaluation Technique:

It was intended this material be used with little teacher help. If teacher assistance is in demand, the program needs revision. The materials will be checked by the teacher on the spot for immediate reinforcement.

CODE: MA-3-G-x-x
MA-4-G-x-x

# MATHEMATICS

## EXEMPLARY UNIT FOR LEVELS 3 and 4

## GEOMETRIC SHAPES IN ACTION

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Geraldine Dwight

# GEOMETRIC SHAPES IN ACTION

## Objectives:

As a result of this unit the student will be able to:

1. Name and recognize the following geometric figures: pyramid, cone, sphere, cube, polygon, cylinder, quadrilateral, parrallelogram, ellipse, square, circle, rectangle, sphere, triangle.
2. Identify and recognize properties of: triangles and triangular regions, rectangles and rectangular regions, squares and square regions, circles and circular regions, parallelograms, quadrilaterals.
3. Recognize the properties of and construct the following figures: curve, closed curve, simple closed curve, line, line segment, congruent lines, place, ray, point.
4. Use a compass, protractor and ruler to construct simple geometric figures.
5. Recognize the properties of and construct a right angle.
6. Recognize and show line symmetry in circles, squares and general shapes.
7. Find the diameter and radius of a circle.
8. Count units to find the area of: square, rectangle, triangle, and polygon.
10. Count cubic units to find volume.
11. Use geometric shapes and properties to construct his own creative figures.

## Activities:

1. Examine and discuss properties of models of geometric figures.
2. Collect, label and display a variety of geometric figures.
3. Using a ruler, compass and protractor, construct plane geometric figures.
4. Draw esthetic geometric designs with ruler, compass and protractor.
5. Construct figures in space using straws, toothpicks, blocks.
6. Use needle and thread to construct plane geometric designs.
7. Construct three-dimensional geometric figures using any materials that are available, i.e. show boxes and string, cardboard, etc.

GEOMETRIC SHAPES IN ACTION (contd)

Materials Available to Students:

Compass, ruler, protractor, scissors, cardboard, paper, oak tag, boxes, flannel board, colored rods, squared paper, graph paper, yarn, needles, thread, shoe boxes. Large and small models of square, circle, rectangle, polygon, cube, sphere, cone, cylinder, prism, pyramid.

Evaluation Technique:

Given a group of objects student will be able to describe and classify the properties of 15 geometric figures.

CODE: MA-5-S-1-a
MA-5-S-2-a

MATHEMATICS

EXEMPLARY UNIT FOR LEVEL 5

# Sets

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Rita Freeman

5-6

OBJECTIVE:

To provide the student with a variety of learning activities related to the concept Sets.

ACTIVITIES:

After teacher presentation and pre-testing each student would be placed at an appropriate level of the unit. Each packet for a concept provides for remediation, grade level success, and enrichment. Materials are individualized with teacher supervision. They include a variety such as tapes, manipulative, worksheets, workbooks and one-to-one help.

MATERIALS:

1. Houghton Mifflin Math Series
2. SRA
3. Attribute games
4. Teacher made materials

EVALUATION:

As the student progresses through each level of the concept evaluation will be a 90% efficiency based on the student's ability and accomplishments throughout a segment of the concept.

CODE: MA-8-N-T-6-a

# MATHEMATICS

## EXEMPLARY UNIT FOR LEVEL 8

## SLIDE RULE USAGE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Edward Coats

## SLIDE RULE USAGE

### OBJECTIVES:

The student will be able to multiply and divide using the slide rule. Through the use of the slide rule, the student will be able to write estimations at different place values.

### MATERIALS:

Four foot demonstrator slide rule; slide rule demonstration transparencies; overhead projector; 12 x 18 card, bristol board or balsa sheet; ruler; pencil; several sheets of ditto paper; scissors; glue.

### ACTIVITIES:

1. Construction of one slide; see attached instruction sheet.
2. Reading of slide rule scales.
3. Multiplication processes.
4. Division processes.
5. Extended activities--
   a. Squaring and square root processes.
   b. Cubing and cube root processes.
   c. Percentages.
   d. Logarithms.

### EVALUATION TECHNIQUES:

1. The student will demonstrate his ability to manipulate the slide rule in the presence of a teacher.
2. A set of 25 multiplication and division problems with which to test the student's ability.
3. Direct feedback from science department when knowledge put to practical use in other classes.

MA-1-S-1*

SETS - GRADE 1

A FOUR WEEK UNIT

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Mary Lou Nevin

Math - SETS - LEVEL ONE

Plans for The First Week of School

Objective:

To develop the concept of a set:

Suggested Activities:

I. The child will have the opportunity to manipulate at least 5 different kinds of objects to make a set.

1. Make a set of all the squares.
2. Make a set of all the red objects.
3. Make a set of all the long ballons.
4. Make a set of all the large beans.
5. Make the yarn circle all of the red apples on the flannel board.

II. The child will have the opportunity to look around the room and show the class a set of objects he has found.

1. The set of all the chairs in the room.
2. The set of chalkboards.
3. The set of tables.
4. The set of boys or girls.
5. The set of a clock.

III. Each child will have the opportunity to cutand paste a picture on one of the set charts.

1. Decide what kinds of sets the class wishes to include - such as color words, animals, houses, people.
2. Each child will look at his magazine and find a picture to add to the set chart.
2. Each child will place his own picture any where on the chart.
4. The finished chart will be displayed for easy reference.

IV. Each child will have the opportunity some time during the week to play the clown game. (This game could also be used in free time as an interest center)

Clown Game

For this game you will need a clown and several sets of ballons. The ballons should be in various colors and shapes--some round, some shaped like animals, some sausage-shaped, some twisted, and so forth. One set could be equivalent to the set of strings, one could have one more ballon that the set of strings, and one could have one less. After you have provided some direction through your questions, let small groups of children experiment freely with these materials to find out for themselves which sets are equivalent and which are not.

Group Size: small or lrge group

Materials Needed: Clown and set of ballons.
(Already Made and located in the math cupboard)

V. Each child will do the Teacher directed pages 1, 2, 3, 4 in the Houghton Mifflin workbook. (attached)

Suggested Free-Time Activities

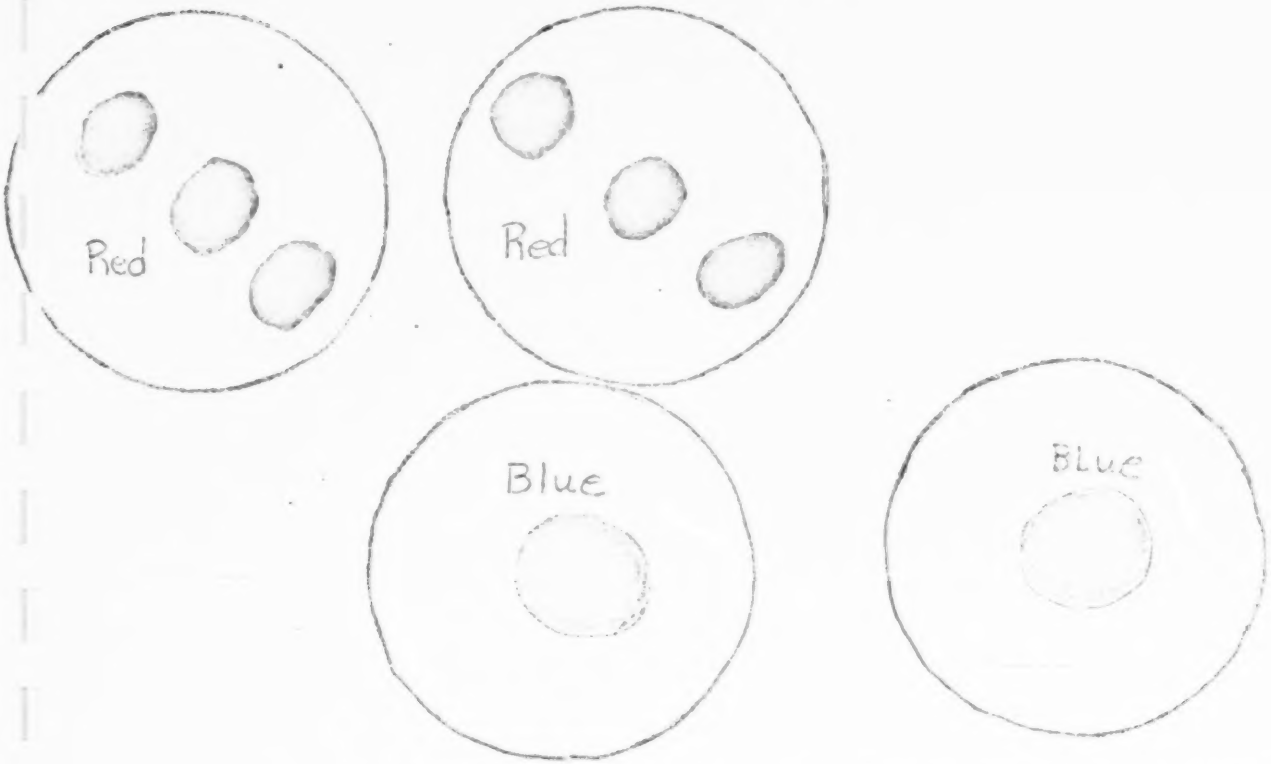
Interest centers are a vital part of the reinforcement of a Math idea. Some suggested interest centers are listed below.

1. Lotto Games

Make a set of 12 round circles. Pair sets of objects from 1 to 6 on each. Cover with clear plastic and store in plastic tubs. The child will be able to go to the Math Center and get a tub with a red marker on it for free time activity. He can either play by himself or with a partner.

The child turns all of the circles upside down and mixes them up. He then turns one over placing it face up in front of him. Then he chooses one more card and if it matches he gets to keep them. If not he places both of them face down

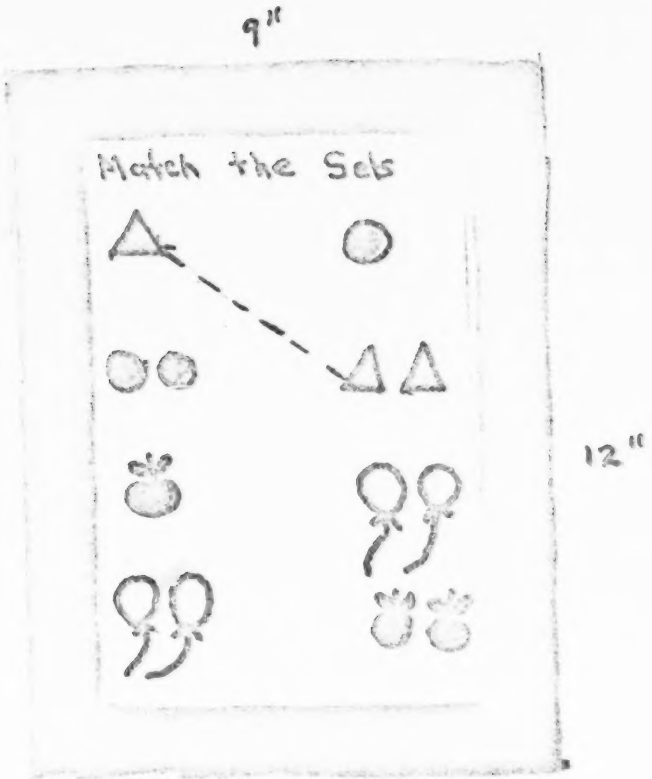
in the playing pile.




The circles are 2" circles. The design on the card should be identical for the first games.

2. Concept Coded Individual Activity Cards.

These cards are made from 9" X 12" bristol board. Selected worksheets from old workbooks are pasted on these boards and then they are covered with clear plastic. (The ones dealing with sets will be coded red. The child uses a black crayon or a china ball marker to mark his answer. The answer is checked as soon as possible for immediate reinforcement.




These can be stored in a cardboard box, such as a detergent box, in the Math Center so the children can get them whenever they want to. This could also be used for checking a certain child on a concept.

3. Extra pages put in plastic.

These pages can be old workbook pages or extra ditto pages. The use of the plastic pocket makes their use very flexible. They can be used as an enrichment activity for free time or a way to check a certain child on a math idea that has been presented. The sheets can be changed as frequently as the teacher desires. When these sheets are used for sets, they will be coded red.

Materials:

I. Suggested Manipulative objects.

These objects will be located in the Math cupboard which should be centrally located, especially in a team situation.

1. Macroni

Give each child a handful of different sizes and shapes of macroni and have them sort them out.
(Macroni can also be colored)

2. Geometric shapes.

Many different Geometric shapes can be cut from construction paper or oak tag. To start out use squares, retangles and triangles. Give the students two different sizes of the same shape the first time. Then add more shapes until you have large and small squares, large and small retangles and large and small triangles. Then have them sort them into sets by shape, color, size, etc. All the large shapes could be one color, such as green and all the small shapes blue.

3. Beans

Different kinds of beans can be mixed up and each child given a handful. Have him sort them into kinds, colors and size.

4. Pencils.

Have a group of pencils available, and have the children see if they have enough for a certain group, or the whole class.

5. Cuisinaire Rods.

These rods are excellent for manipulative ideas. The children could match the rods with a set of rods you have shown them. They can use them to sort out colors. These are very good for free time.

6. Flannel Board, objects, and yarn to circle objects.

The flannel board can be used to have the children show you sets of objects. If there are enough chapes available, the child can have their own objects and make the sets on their boards. The yarn is used to ring or circle certain objects.

7. Dittoes (ifneeded)

Evaluation:

Pre-Test: The child will be given a set of objects and allowed to play with the objects and manipulate them in any way he wants to. This will help him get acquainted with manipulating objects, and putting them in different groups.

Post-Test: The teacher will observe the child demonstrating his ability to recognize the concept of a set by manipulating objects, such as: Show me a set of red objects. Show me a set of all of the squares. The teacher will record on a sheet the children that are having difficulties and need additional help.

Additional Activities

I. Enrichment Activities.

Each child who has shown his or her ability to understand sets and has successfully passed the post test, will have the opportunity to help another child or construct a "Color Domino" gme for the class to use.

"Color Domino"

Give the Children a 3" X 6" card and have them draw colored pictures at either end. Children play the game by placeing pictures of the same color next to each other.

II. Extended Activities.

Each child who was having difficulty during the post test will have the opportunity to have additional help through extended activities:

1. Read the story of "The Three Bears" (use flannel board story if possible) Discuss the story and see if the children will discover the sets in the story.
2. Manipulate objects that have meaning to them.

Match equal number of cups and saucers.

Take cups and saucers and put them in piles.to make a set of cups and a cet of saucers.

Direct the child to put some trees on the flannel board - lead him to discover he has put a set on the board.

Math - SETS -Level One.

Plans for the Second Week of School.

Objective:

To introduce the concept of equivalent and non-equivalent sets.

To introduce the terms more and fewer.

Suggested Activities:

I. The child will have the opportunity to manipulate and compare at least 5 sets.

1. Compare the squares with the triangles. Do you have the same number? Which do you have more of? Which do you have fewer of?

2. Compare the red circles with the blue circles. Do you have the same number? Which do you have more of? Which do you have fewer of?

3. Compare your file of macroni. Separate it into piles of macroni that are the same kind and size. Which pile do you have more of? etc.

4. Compare the white cuisinaire rods with the green cuisinaire rods. Do you have the same number? etc.

5. Make two sets on your flannel board. Do the sets have the equal members? Did you make one set with more objects. Did you make one set with fewer objects?

II. Each child will have the opportunity to show equivalent and non-equivalent sets in the room.

1. Have a child put some chairs in the front. Let another child choose enough children to fill the chairs. Discuss what he did. Did he have equivalent sets or non-equivalent sets.

2. Match the number of boys and girls in the room. Discuss how they compare.

3. Give some child a pile of books and have him hand them out to a certain table. Discuss what happened.

4. Match the number of children to the number of chairs in the room, or the number of tables. Discuss.

5. Match the doors and windows in your room. Discuss how they compare.

III. Each child will have the opportunity to participate in the "Match the Sets" game.

Match the Sets:

Pass out set card to the class. Draw a set of objects on the board to form a set of objects. (or use flannel board) Those students whose Set Cards show more objects than the displayed set should hold up their cards. Name a student to come forward with their card and hold it up. Have him name another student who is to tell whether his card has more than, fewer than, or the same number of objects as the first students card. If the student is correct he then chooses another student.

Set Cards would show groups of from 0 - 10 on the cards. If the child is correct, have him give his card to a student who does not have a card and continue on with the game.

These cards can be made from oak tag and dot pasted on to make the desired set.

Group Size: Large group

Materials Needed: Set Cards.

IV. Each child will have the opportunity some-time during the week to play the clown game.

Use the same game as used in week one, only this time use the non-equivalent sets of ballons.

V. Each child will have the opportunity to play the game "Musical Chairs"

Place 10 chairs turned in alternating directions in a row. Call on a child to sit in each chair. There are now equivalent sets of chairs and children. Ask the children to stand and be ready to march when the music begins. Remove 1 chair. Tell the childrento march around the chairs until the music stops and then sit down in a chair. They will soon find that the sets are no longer equivalent. The child without a chair is retired from the game. Another chair is removed and the game continues.

VI. Each child will do the Teacher directed pages 5, 6, 7, 8, 9, 10 in the Houghton Mifflin workbook. (attached)

Suggested Free Time Activities.

The same interest centers can be used as were used in week-one with a few modifications.

1. Lotto Games.

Use the lotto cards again, but this time if the child can match a set that is more than the first one he turned over, he gets to keep the card. This could also be used if the second card had fewer objects, he could keep it. Before the game is started an agreement much be reached as to weather they will use more or fewer on this game.

2. Concept Coded Individual Activity Cards.

These 9" x 12" cards will be similar to those used the first week. Cards with non-equivalent sets will be added to those that are already in the Math Center. All of these cards will be coded red.

3. Extra pages put in plastic.

. The worksheets in the plastic envelopes will now need to be changed to non-equivalent sets. (However, if some children are still having problem with equivalent, some should be left for them to use) The procedure for the use of these sheets is the same as week one.

Materials:

I. Suggested Manipulative Objects.

These objects will be located in the Math. Cupboard which should be centerally located, especially in a team situation.

1. Macroni

Give the children a handful of different sizes and shapes of macroni. Have them see which sets are equal, which has more and which has fewer.

2. Geometric Shapes.

Have the children compare the different geometric shapes used in week one. You may wish to vary the numbers in the sets so you can show those that are equal or equivalent and those which have more or fewer.

3. Beans

Give the children a handful of beans of different sizes and colors. Have them sort them into piles of likebeans. Have them see which sets are equivalent and non-equivalent.

4. Pencils

Have a child give out a pile of pencils. Discuss how they compare to the members of the class.

5. Cuisinaire Rods

Choose two or three different colors of rods and have the children compare them.

6. Flannel Board and objects.

Place two different groups of objects on the flannel board. Use pieces of yard and have the children match them, and tell if the sets are equivalent or non-equivalent. (this could be extended into a fee time activity for the children.

Evaluation:

Pre-Test: Each child will be given a set of objects and allowed to play with the objects and manipulate them in any way he wants to. This will hlep him get acquinted with the idea of equivalent and non-equivalent sets.

Post-Test: The teacher will give each child a handful of small colored marshmellow. She will observe the children sorting them out into piles according to colors. After the child has sorted the colors and knows if he has equivalent or non-equivalent sets, he tells the teacher about his sets of marshmellow. If he is correct he gets to eat his marshmellows. If he is not, his name is recorded and he is helped, so he will also be able to eat his or her marshmellows.

Each child will have a different number of marshmellows, so it will be easy to check to see if he is sure of the concept.

Additional Activities:

I. Enrichment Activities.

Each child who has shown his or her own ability to understand the concept of equivalent or non-equivalent sets will have the opportunity to help another child, or manipulate objects to make groups of joining and disjoining sets - through the discovery method.

II. Extended Activities.

Each child who was having difficulty duringthe post test will have the opportunity to have additional help through manipulative extended activities.

1. Use the flannel board to match sets of objects.

2. Use an individual chalkboard. Have the child draw 3 dots. Have him add another dot. Does he have the same amount as he had before. Why or why not?

3. Use sets of chairs. Send a few children to sit down on the chairs. Were there enough children? Were there too many? Why?

4. Use sets of boys and girls. Have them hold hands. How do the groups compare?

5. Show me a set of squares. Show me a set of triangles. Put the triangle on top of the square. Do you have any left? Did you have enough? How do they compare?

Math - SETS - LEVEL ONE

Plans for the Third and Fourth Weeks of School

Objective:

To introduce the sets with cardinal numbers.

To provide practice in recognizing sets in comparison with other sets.

Suggested Activities:

I. The child will have the opportunity to manipulate objects to show sets of from 0 - 6.

1. Show me a set of 4 objects.

2. Hold up a numeral such as 3 and see if the child can form a set of 3 objects.

3. Make a set of 4 objects. Add 1 more object. How many objects do you have now? Can you find me the numeral 5?

4. Make several sets on one side of the flannel board. Put the numerals on the other side. Have some children match the objects with the numerals, using yarn.

5. Make a set of objects on the flannel board. Under the set of objects, place 4 different numerals. Have the children tell how many objects are in the set and circle the correct numeral.

II. The child will have the opportunity to show that he knows his numerals from 0 - 6 by showing how many beads on the bead frame are needed for the numberal shown him.

1. Shown the numeral 5, the child will use his hand and cover all of the beads except for 5.

III. The child will have to opportunity to draw the correct number of objects on his individual chalkboard after a numeral card has been shown to him.

1. If shown the numeral 1, the child should count one object, etc.

IV. Each child will have the opportunity to make his number in order to left.

1. Each day that a cardinal number is introduced, the child should be given a piece of paper and asked to make the same number of circles as the cardinal number for that day.

2. Each child will have the opportunity to cut and paste a picture with 0-6 objects in it, depending on the cardinal number for that particular day.

3. When all of the cardinal numbers from 0-6 have been introduced, and correspondingly practiced, the child will now be ready to order his booklet.

V. The child would have the opportunity of using cut scraps to help him associate the concept of the cardinal numbers.

1. Ten Little Indians

2. Pair Of Pen

VI. The teacher may want to use stories to help develop the concept of the cardinal numbers.

1. Books available in Hoffpauir Library.

De Step, Thea - Ten Apples Up On Top
Fehr, Howard F. - Five is 5
Francoise - Jean Marie Counts Herbacop.

2. Other suggestion books

Anrbach, Melorie - Seven Uncles Come to Dinner
Friskey, Margaret - Chicken Little Counts to Ten
Friskey, Margaret,- Seven Diving Ducks

Elkin, Benjamin - Six Foolish Fisherman
Leodhas, Sorche Nic - All in the Morning Early

VII. Each child will have the opportunity to bring an object for an object train.

1. The train can be made from milk cartons or shoe boxes, depending on the size wanted. The numerals from 0 - 6 are written on the outside of each box. The children will then put the correct number of objects in each box. A free time activity could be for a child to check the train to make sure each car has the right amount of objects.

VIII. Each child will have the opportunityto play the game, "Feel the Number" some time during the two week period.

Feel the Number

A child is blindfolded and askedto feel a sandpaper numeral. After he has felt the numeral he tells what he thinks it is. The blindfold is then removed and if he is correct, he chooses another child to be blindfolded and he gets to choose the number for than child to feel.

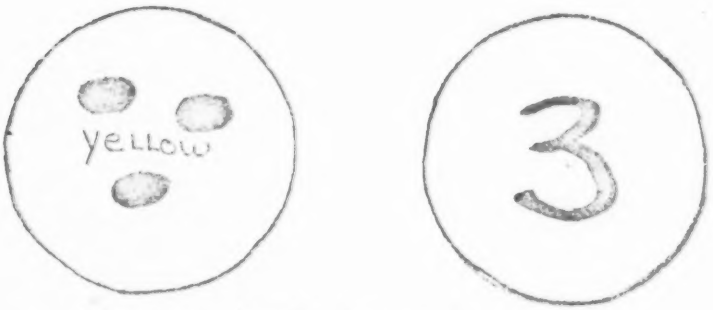
Group Size: Small or large group

Materials needed: Sandpaper numerals and blindfold.

Suggested Free-Time Activities.

I. Lotto Game.

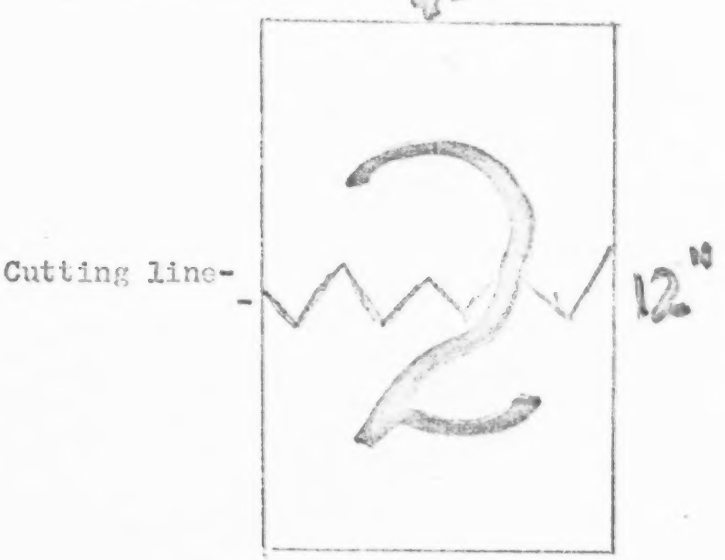
The lotto game will now be changed to match the numeral and sets. Use the numerals 0-6 and objects to match each card.




Circles should be 2" in diameter.

2. Numeral Puzzles.

Write a numeral on a piece of 9 x 12 paper. If the numeral is 2, cut the puzzle in 2 parts. Write a small numeral 2 on the back so the puzzle pieces will not be confused.



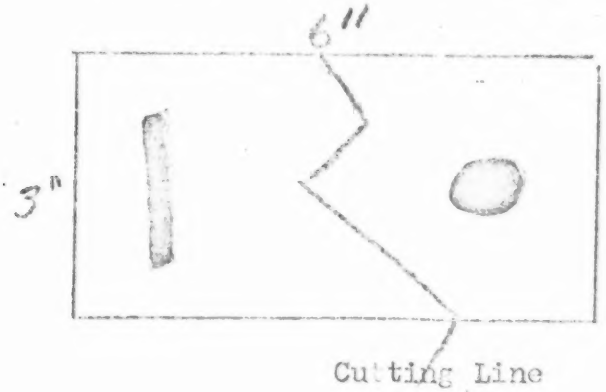

3. Sandpaper Numerals.

Sandpaper numerals can be pasted on pieces of paper. If the number 6 is pasted on, then there could be 6 squares of sandpaper to help relate the sets with the cardinal number.

4. Domino Puzzles

Use a 3" x 6" piece of oaktag. On one

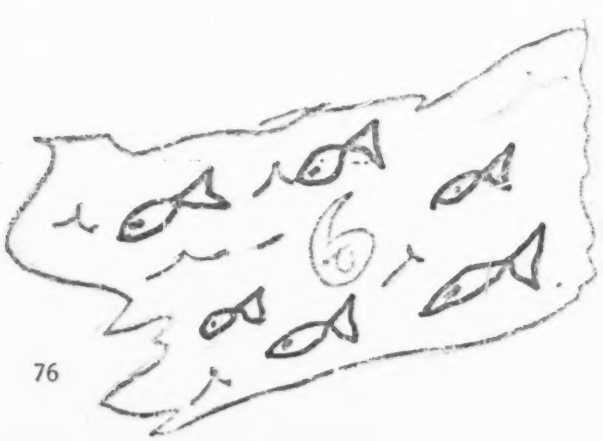
side put the numeral and on the other side a set of objects. (These could also be done in sandpaper) Cut the two apart to make a puzzle.




5. Fish in the Pond.

Cut out 7 small lakes. Write the numerals 0 - 6 on each one. Make 21 small fish. Put a paper clip on the fish. Make a fishing pole from a stick, piece of string and a magnet.

The child puts down his small lakes. Then he turns all of the fish face down. He fishes for a fish and puts his fish in the correct lake. Lake 0 won't have any fish while Lake 6 will have 6 fish in it.



6. Color Coded Activity Cards.

The cards will be the ones that have to do with the cardinal number of a set. They will again be coded red for sets.

7. Extra pages put in plastic.

The worksheet in the plastic will now need to be changed to cardinal numbers of a set. The procedure is the same as started the first week of school

8. Boxes of Sand or Cornmeal.

These boxes are used for practice in drawing sets of objects. If the child makes a mistake, he can immediately correct it without any trouble.

Materials Needed:

Suggested Manipulative Objects.

1. Objects such as macroni, beans, pencils, etc. can still be used to show a certain number.

2. Individual Chalkboards.

Have the children draw a set of 3 or a set of 5. After they have drawn the set, they turn their chalkboard around and show it to the teacher.

3. Individual Flannel Boards

Have the children use small pieces of felt to show a set of objects to match the cardinal number.

Make a set of objects on the big flannel board. Allow the children a few minutes to look at it and then take it down. See if they can reproduce the set with the same number of objects.

4. Numeral Cards with the numerals from 0-6.

5. Sandpaper numerals from 0-6.



6. Boxes of cornmeal or sand.

Evaluation:

Pre Test: The children will be asked to show a set of objects from 0-6. This may be done with the flannel board or chalkboard. This will give the teacher an idea if some of the students are ready for Cardinal Numbers.

Post Test: The children will do pages 16 and 17 of the Houghton Mifflin Workbook with 95% accuracy.

Additional Activities:

I. Enrichment Activities.

Each child who has shown that he knows his cardinal numbers will have the opportunity to use the cornmeal box, sand filled box, or the chalkboard to draw sets of objects and write the numerals for those objects.

He will have the opportunity to help another child by drawing a set of objects in either the cornmeal or sand box. He will ask the other child to reproduce the same number of objects. Then he will ask the child how many objects he drew.

He will have the opportunity to write a numeral on a chalkboard with a paintbrush dipped in water. He will then ask the child to draw the correct number of objects.

II. Extended Activities.

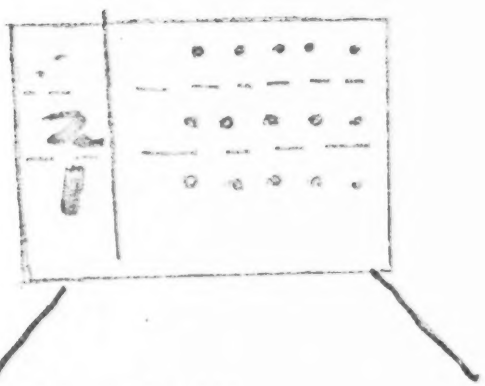
1. The child will use the cornmeal or sand box to draw sets of objects. He will be immediately checked and if there is an error, he shakes the box and starts over.

2. The child will have the opportunity to use a paint brush dipped in water to paint the correct number of objects.

3. The child will have the opportunity to manipulate flannel board numbers and objects.

4. The child will be able to manipulate the sand-paper numerals and match objects to the numerals.

5. The child will have the opportunity to work with peg boards using peg-board patterns. ( 1st row - 1 green peg.



Separate card with colored numbers to show how many pegs go in the first row, etc.

Peg Board.

6. The Child will have the opportunity to work with beads and make bead patterns.

## REFERENCES


Addison-Wesley - - Elementary School Mathematics, Book 1

American Book Company - - Meeting Mathematics, Book 1

Harper& Row -- New Dimensions in Mathematics Teachers Edition, Grade 1

Houghton-Mifflin - - Modern School Mathematic -- Book 1

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MA-4-0-6-b

# ADDITION OF LIKE FRACTIONS

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Don Bennett

## ADDITION OF LIKE FRACTIONS

Behavorial Objective:

The student will be able to satisfactorily add like fractions using manipulative materiels and with paper and pencil, as measured in the evaluation.

Entering Behavior:

The student must be able to:

1. write a number sentence.
2. add whole numbers.
3. reduce fractions.
4. distinguish colors.
5. recognize a circle, a rectangle, and a footlong ruler.
6. recognize a mixed numeral.
7. recognize the names and know the meanings of the parts of a fraction.

Material:

1. Five red fifths
2. Four green fourths
3. Seven blue sevenths
4. A board large enough to hold the outlines of a circle (fifths), a square (sevenths) and a rectangle (fourths).

## ADDITION OF LIKE FRACTIONS

PRETEST

1. Write the name for each part of the fraction 3/4 : 3 is the _____
   4 is the _____

2. A. The top number in a fraction tells the _____.
   B. The bottom number in a fraction tells the _____.

3. ADD

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6/4 | 3/2 | 5/4 | 2/6 | 6/8 | 16/8 | 11/4 | 12/5 | 7/8 | 9/7 | 8/3 |

4. Write a number sentence for the following situation.

   John has six marbles and wins three more. How many marbles does he have.

   _____

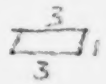
5. Reduce the following fractions to lowest terms.

   2/4 = 3/9 = 4/10 = 5/15 = 6/8 =

6. Match the following fractions with the proper name.

| | | | |
|---|---|---|---|
| 1/2 __ | 2/4 __ | 1 1/2 __ | A. Proper |
| 3/2 __ | 3/1 __ | 4 3/8 __ | B. Improper |
| 2/3 __ | 6/5 __ | 5 6/7 __ | C. Mixed |

7. Match the figure with the name.

   A. circle ____ D. 
   B. square ____ E.
   C. rectangle ____ F.

8. Match the correct color with the name.

   A. ___ D. ___ 1. blue 4. green
   B. ___ E. ___ 2. red 5. orange
   C. ___ F. ___ 3. yellow 6. black

DISCOVERY METHOD FOR LEARNING HOW TO ADD LIKE FRACTIONS

Direction #1

Go to the fraction kit and get the 5 red pieces and the fraction board. Return to your seat and place the red pieces on the circular outline on the board so you create a circle.

Question #1

The circular region made with the red pieces is divided into how many parts? _____

Question #2

The name of each red piece is _____.

Direction #2

Take all red pieces off the board, then place one piece back.

Question #3

How many pieces (fifths) do you have on the board? _____

Question #4

How much of the circular region do you now have on the board? _____

Question #5

What is the name of the piece you put on the board? _____

Direction #3

Add one piece to the board.

Question #6

How much of the circular region did you add to the 1/5 already on the board? _____

Question #7

How many fifths do you now have on the board? _____

Question #8

How much of the circular region do you now have on the board? _____

Direction #4

Write a number sentence for the addition you performed. Begin with the third set of directions, and remember, you already had 1/5 of the circular region on the board. _____

Direction #5

Return the red pieces or fifths to the materials kit and take the blue pieces to your work area. There should be seven blue pieces.

Place all the blue pieces on the board so you make a square region with them. Make sure your pieces match the region on the board.

Question #9

This square is divided into how many pieces? _____

Question #10

The name of each piece is _____.

Direction #6

Take all the pieces off the board. Place two of these pieces back on the board.

Question #11

How many sevenths do you have on the board? _____

Question #12

How much of the square region do you now have on the board? _____

Directions #7

Add four pieces of the square region to the board.

Question #13

How much of the square region did you add to the two pieces already on the board? _____

Question #14

How many sevenths do you now have on the board? _____

Question #15

How much of the square region do you now have on the board? _____

Direction #8

Write a number sentence for what you did when you followed direction #7. Remember you had two sevenths and added 4 sevenths.

Direction #9

Return the sevenths (blue pieces) to the materials kit and take the green pieces to your work area. There should be four green pieces.

Place all the green pieces on the board so that they look like a reler. Make sure your pieces match the region on the board.

Question #16

This rectangular region is divided into how many parts? _____

Question #17

The name of each piece is _____

Direction #10

Remove all the pieces from the board. Place one piece on the board.

Question #18

How many fourths do you have on the board? _____

Question #19

What is the name for the part of the stick you have on the board? _____

Directions#11

Add 2/4 or two green pieces to the 1/4 or one green piece already on the board.

Question #20

How much of the rectangular region did you add to the board in direction 11?

Question #21

How many pieces or fourths do you now have on the board? _____

Question #22

How much of the rectangular region do you now have on the board? _____

Direction #12

Write a number sentence for what you did when you followed direction #11. Remember, you already had 1/4 on the board and then added 2/4.

Direction #13

Take all the green pieces off the board. Place on e piece back on the board.

Question #23

How many fourths do you now have on the board? _____

Direction #14

Question #24

How many fourths do you now have on the board? _____

Question #25

What part of the rectangular region do you now have on the board? _____

Direction #15

Question #26

How many fourths do you now have on the board? _____

Question #27

What part of the rectangular region do you now have on the board? _____

Direction #16

Write a number sentence to tell what you did with the green pieces when you followed directions #14 and #15. _____

CONCLUSION

Question #1

What did you do with the denominators in the number sentences you wrote for Directions 4, 8, 12 and 16 to get your answers?

Question #2

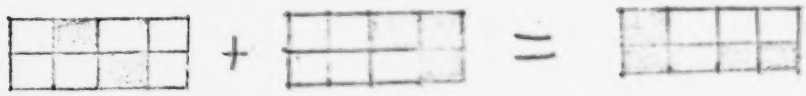
What did you do with your numerators in these number sentences to get your answers?

Question #3

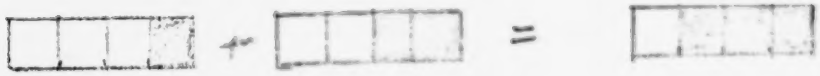
Give me a rule for adding like fractions.

## EVALUATION

1. Write number sentences for the following drawings.



_____



_____

2. Draw pictures to represent the following sentences.

$\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

$\frac{3}{7} + \frac{2}{7} = \frac{5}{7}$

3. Add

| | | | | | | |
|---|---|---|---|---|---|---|
| $\frac{2}{8}$ | $\frac{1}{3}$ | $\frac{3}{5}$ | $\frac{2}{6}$ | $\frac{2}{7}$ | $\frac{6}{9}$ | $\frac{8}{10}$ |
| $\frac{1}{8}$ | $\frac{1}{3}$ | $\frac{1}{5}$ | $\frac{3}{6}$ | $\frac{4}{7}$ | $\frac{2}{9}$ | $\frac{1}{10}$ |

## ADDITION OF LIKE FRACTIONS

WORKSHEET

| | | |
|---|---|---|
| 3/4 + 6/4 = ____ | 2/3 + 5/3 = ____ | 7/8 + 3/8 = ____ |
| 1/2 + 1/2 = ____ | 2/5 + 2/5 = ____ | 1/6 + 4/6 = ____ |
| 2/4 + 3/4 = ____ | 1/3 + 3/3 = ____ | 2/8 + 3/8 = ____ |
| 7/9 + 1/9 = ____ | 3/5 + 4/5 = ____ | 5/9 + 4/9 = ____ |
| 2/6 + 3/6 = ____ | 2/4 + 1/4 = ____ | 4/7 + 3/7 = ____ |

Supplemental Practice Materiel

MA5S4b*

# SETS

## FIFTH GRADE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Rita Freeman

1. OBJECTIVE

The 5th Grade Pueblo student will demonstrate his knowledge of set identification of subsets, supersets, and universal sets by attaining an 85% score on a given post-test.

2. ACTIVITIES

| | | | |
|---|---|---|---|
| Material to be used: | Pre-Test | - | Teacher constructed |
| | Track I | - | |
| | | - | Houghton Mifflin |
| | Track II | - | Text - Page 1 |
| | | - | and 2 Workbook |
| | Track III | - | |
| Material to be used: | Post-Test | - | Teacher constructed |
| | Track I | - | |
| | | - | |
| | Track II | - | Ditto Sheet 1 |
| | | - | Houghton Mifflin |
| | Track III | - | Series |

PRE-TEST POST-TEST

List the members of the sets.

1. {Whole numbers between 50 and 55} = _____

2. {Vowels} = _____

3. {Number of players on a baseball team} _____

Describe the sets

4. {North, south, east, west} = _____

5. {Touch, taste, sight, hearing, smell} = _____

Name the subset and superset

A = {Dave, Jim, Mike}

B = {Don, Mike}

6.

7.

C = {animals}

D = {Cat, dog, pig}

8.

9.

Name a universal for each

10. {Alaska, Arizona, Kansas} = _____

11. {Ohio, Mississippi, Nile} = _____

12. {1, 3, 5, 7, 9, 11 .....} = _____

Name_____ Score_____

SETS, SUBSETS, SUPERSETS

List the objects in these sets.

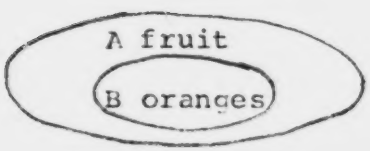
1. {the first three counting numbers} {----------}
2. {the first two days of the week} {----------}
3. {the odd numbers from 0 to 10} {----------}
4. {the even numbers from 11 to 20} {----------}

Describe these sets.

5. {North, South, East, West} {----------}
6. {January, June, July} {----------}
7. {a, b, c, d, e} {----------}
8. {touch, see, hear, taste, smell} {----------}

Complete these charts. The first one is done for you.

9.

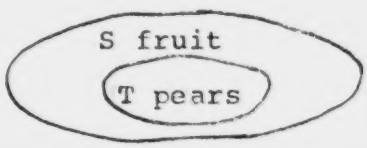



| Words | Symbols |
|---|---|
| B is a subset of A | B $\subset$ A |
| A is a superset of B | A $\supset$ B |

10.

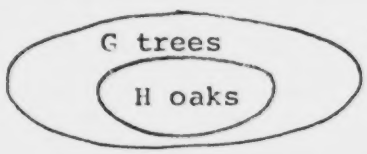
| Words | Symbols |
|---|---|
| ----is a subset of---- | |
| ---is a superset of---- | |

11.




| Words | Symbols |
|---|---|
| ----is a subset of---- | |
| ----is a superset of--- | |

12.




| Words | Symbols |
|---|---|
| ----is a subset of---- | |
| ---is a superset of--- | |

Objective

Intersection and Union:

Each 5th grade student will demonstrate his mastery of the concepts intersection and union and the symbols for them by completing 85% of the given problems correctly.

Large Group

Sheet 2 as Pre-Test 85% necessary for mastery

Extra work for those needing it. Workbook Page 3

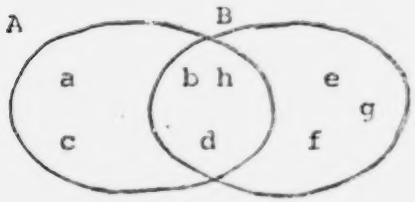
Post-Test

Sheet 2 again for those not achieving 85%

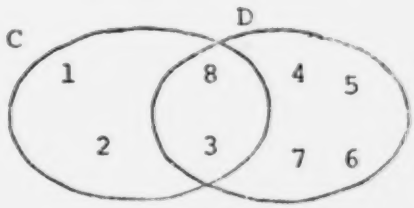
Name_____ Score_____

## UNION AND INTEPSECTION OF SETS

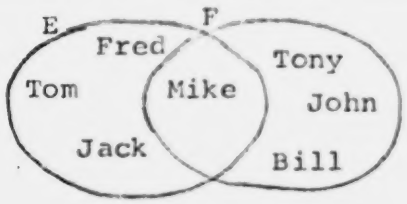
Use the diagrams to help you answer the questions



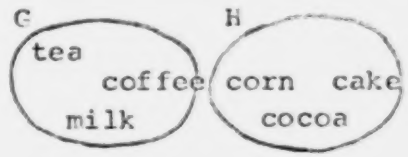

1. A = {----------}
2. B = {----------}
3. A ∪ B = {----------}
4. A ∩ B = {----------}




5. C = {----------}
6. D = {----------}
7. C ∪ D = {----------}
8. C ∩ D = {----------}




9. E = {----------}
10. F = {----------}
11. E ∪ F = {----------}
12. E ∩ F = {----------}




13. G = {----------}
14. H = {----------}
15. G ∪ H = {----------}
16. G ∩ H = {----------}

Use the given information to help you fill in the blanks. Then draw the set diagrams.

17. I = {1, 2, 3, 4, 5}
18. J = {2, 4, 6, 8, 10}
19. I ∪ J = {1,2,3,4,5,6,8,10}
20. I ∩ J {----------}

21. K = {a, e, i, o, u}
22. L = {y, o, u}
23. K ∪ L = {----------}
24. K ∩ L = {----------}

CONCEPT

SETS

Objective

The 5th grade Pueblo student will demonstrate his knowledge of Cross Products and Cardinal numbers by attaining an 85% score on a given Post-Test.

Activities

Materials to be used:

Pre-Test - Sheet 26 (Houghton Mifflin)

1. Track I

   Track II - Page 32 Houghton Mifflin Workbook

   Track III

2. Overhead visuals (See attached example)

3. Manipulative materials - students will use dice and marbles to demonstrate cross product.

4. Sheet 26 - as Post-Test

5. Houghton Mifflin Test 5 - used in enrichment

REPRODUCED ON A TRANSPARENCY FOR CLASS DISCUSSION

Find $A \otimes D$

$A = \{1, 2, 3\}$

$D = \{a, b, c\}$

$\{1 \otimes a, 1 \otimes b, 1 \otimes c, 2-, --, --, ------\}$

---

Find $A \otimes B$

$A = \{\square, \bigcirc, \triangle\}$

$B = \{1, 2, 3, 4\}$

$\{\square \otimes 1, \square -, --, --, --, --, --, --, --, --, --, --\}$

Name_____ Score_____

## CROSS PRODUCT SETS

Set C = {Jim, Bob, Sam}

Set D = {book, pencil, paper, eraser}

Write the members of C ⊗ D.

1. Jim, book | Bob, book | Sam, book

_____ | _____ | _____

_____ | _____ | _____

_____ | _____ | _____

Name the cardinal number for the sets above.

2. n (C) = _____ 3. n (D) = _____ 4. n (C ⊗ D)= _____

Use the sets below to name the cardinal numbers.

G = {1, 2, 3, 4} K = {◇, ○, □, ○△}

S = {a,e,i,o,u,y} T = {Mary, Jane}

5. n (G) = _____ 11. n (S) = _____ 17. n (S) = _____

6. n (K) = _____ 12. n (K) = _____ 18. n (T) = _____

7. n (G ⊗ K) = _____ 13. n (S ⊗ K) _____ 19. n (S ⊗ T) = _____

8. n (G) = _____ 14. n (G) = _____ 20. n (K) = _____

9. n (T) = _____ 15. n (S) = _____ 21. n (T) = _____

10. n (G ⊗ T) = _____ 16. n (C ⊗ S) = _____ 22. n(K ⊗ T)= _____

How many pairings can be formed from each pair of sets?

23. 3 chairs and 7 girls _____ 25. 5 dresses and 2 sweaters_____

24. 5 boys and 8 bats _____ 26 4 pants and 9 shirts _____

MA6S4b*

# SETS

## SIXTH GRADE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Rita Freeman

Objective:

The 6th year student will be able to recall the meaning of set, subset, superset, and empty set introduced in previous grades by achieving 90% accuracy on a post-test.

Materials and Activities

a) In a small group the student will answer orally at least 8 problems presented by the instructor similar to those on page 2 and 3 of the Houghton Mifflin text.

b) Answer in discussion Page 1 of the Houghton Mifflin workbook. (See attached sheet.)

c) The student can make a small bulletin board to show subsets and supersets.

d) The student can build a mobile to demonstrate the meaning of sets, subsets, and supersets either by himself or with a partner.

Sample Questions

1. List the objects in the set.

   A = {odd numbers less than 30}

2. Describe the members of the set.

   A = {0, 2, 4, 6, 8, 10, 12}

3. Name the subset and superset.

   A = {1, 3, 5, 7, 9}  C = {1, 3}

4. A = {2, 4, 6}  B = { }

POST-TEST

| Sets | Key |
|---|---|
| List the objects in the sets. | |
| 1. A = {the last 5 letters in the alphabet} | V, W, X, Y, Z |
| 2. H = {names of the 4 oceans in the world} | Pacific, Atlantic, Indian, Anarctic |
| Describe the objects in the sets. | |
| 3. B = {a, e, i, o, u} | Vowels |
| 4. D = {spring, fall, winter, summer} | Seasons |
| Name the subset and superset. | |
| 5. A = {1, 2, 3, 4} | Subset 1, 2, 3 |
| C = {1, 2, 3} | Superset 1, 2, 3, 4 |
| 6. A = {red, yellow, green, blue} | Subset - yellow |
| B = {yellow} | Superset - red, blue, yellow, green |
| 7. The subset of these two sets would be - | |
| A = {Prime Numbers} | Subset { } |
| B = {even Numbers} | |
| 8. Describe the members of the following set. | |
| A = { } | |

## SETS

### Objective

The student will be able to identify that a number is a solution of a number sentence if it makes the sentence true. In solving a number sentence the student must know the set from which the replacement for the placeholder can be chosen.

### Activities

a.) Houghton Mifflin Modern School Mathematics P. 130-131, 8-12 selected problems as to the individual's need.

b.) Houghton Mifflin Modern School Mathematics P. 43-44, selected problems. (See attached sheet.)

c.) Addison Wesley Activity Cards, E-11, F-6, F-21, 6-19.

d.) Transparencies (teacher constructed).

### Evaluation

Houghton Mifflin Diagnostic Test 11, Section A & C. (See attached sheet.)

Objective

Once the student has recognized the meaning of empty sets he will be able to recognize that sets are disjoint if they have no members in common.

ACTIVITIES:

1. a. Arrange students into rows and columns. Let 1st row be Set A, and 1st column Set B.

   b. Establish $A \cup B$

   c. Establish $A \cap B$

   d. Row 2 = C

   e. Row 4 = D

   f. Establish $C \cup D$ is empty

2. a. List 3 sets on board

   $A = \{a, b, c\}$

   $B = \{b, c, d, e\}$

   $C = \{d, e, f\}$

   b. Identify: $A \cup B$

   c. Identify: $A \cup D$

3. Attribute Games - McGraw Hill

Additional Materials

1. Houghton Mifflin Co.
   Modern School Mathematics

2. Harcourt Brace
   Elementary Mathmetics

3. Houghton Mifflin Co.- (Use for a small group of
   Programmed Practice independent workers.)

4. Houghton Mifflin Co.
   Workbook - Modern School Mathematics

Evaluation:

1. Diagnostic Test
   Modern School Mathematics Houghton Mifflin Test 13

2. Duplicating Master Sheets
   Modern School Mathematics Houghton Mifflin Sheet I

Objective

The student will be able to identify finite and infinite sets by achieving 90% accuracy on a post-test.

Activities

a.) In a large group all students will participate in a discussion of Page 7 in the Houghton Mifflin Text.

b.) Students can illustrate their knowledge of finite and infinite sets by diagrams or diaramas.

Post-Test

Tell whether the following sets are finite or infinite.

1. {animals} = F

2. {people in the world} = F

3. {heavenly bodies} = I

4. {even numberies} = I

Give examples of the following.

5. Finite set. _____

6. Infinite set. _____

7. Explain that the set of counting numbers is infinite. _____

_____

Objective:

The student will demonstrate that the solution to an open sentence is the number that makes a sentence true.

Activities:

1. Write on chalkboard a set of:

   a. equivalent open equations

      ex. $n = 3$ $\quad n + 4 = 7$

      $n + 1 = 4$ $\quad n + 3 = 6$

   b. Have students make up own set.

2. Write on chalkbaord 2 pairs of equivalent inequlities.

   ex. $7 \times n = 28$ $\quad 3 \times n = 30$

   $n \quad 4$ $\quad n \quad 10$

3. Draw a 26 x 26 number plane on chalkboard. Have each student write a number pair from the first letters of his first name and surname, numbering the letters according to their place in the alphabet:

   ex.

References/enrichment

| | |
|---|---|
| 1. Page 5 - Houghton Mifflin Workbook | All students |
| 2. Duplicating Master Sheets #6,8,9,10,31,32 | All students |
| 3. Programed pages 9-11, 13-14, 51, 54, 55 | Advanced students |
| 4. Work books pps. 11, 12, 14, 43, 46 | Remedial Students |

Objective

To develop the concept of an ordered pair and the cross product of 2 sets.

Activities

a.) The students will list all of the batteries that can be formed from a set of pitchers and catchers.

b.) Using colored beads the students can demonstrate their knowledge of cross product.

c.) Modern School Mathematics Workbook Activities (P. 4) 85% efficiency. (See attached sheets.)

d.) Houghton Mifflin Modern School Mathematics (P. 8-9) - to be used for classroom discussion.

e.) Houghton Mifflin Modern School Mathematics Workbook (P. 4) - see attached sheet.

f.) Attribute Games - (McGraw Hill) - in the guide manual for this set is a number of games that can be used to reinforce this concept.

Post-Test

85% proficiency - problems similar to those on the worksheet.

Name_____Score

## Equivalent Sets and Cross Products

Use the sets below to answer the questions.

A = {p, b, t, d, c}

B = {h, l, r}

C = {days of the week}

D = {numerals on a telephone dial}

E = {nickel, dime, quarter}

F = {f}

G = {girls over 200 years old}

H = {a, b}

I = {odd numbers less than 10}

J = {p, h, l}

1. n (A)=_____
2. n (C)=_____
3. n (D)=_____
4. n (G) = _____
5. n (I) = _____
6. n (A∪B)=_____
7. n ( J∪B)=_____
8. n (C∪H)=_____
9. n (E∪C) =_____

10. Name the sets equivalent to B: _____
11. Name the sets equivalent to A: _____
12. Name the sets equivalent to F: _____

Name the cross products.

13. B ⊗ H = _____
14. J ⊗ B = _____
15. A ⊗ F = _____
16. F ⊗ E = _____

Name the cardinal numbers.

17. n (B⊗H) = _____
18. n (J⊗B)= _____
19. n (A⊗F) = _____
20. n (D ⊗ 1) = _____
21. n (D ⊗ G) = _____
22. n (B ⊗ C) = _____

Objective

The student will be able to describe the set that is the intersection of 2 given sets and also the set that is the union of 2 given sets.

Activities

a.) In a small group discussion the student will demonstrate his mastery of the objective by answering orally at least 8 problems from P. 4 and P. 5 of his text book. (Houghton Mifflin)

b.) With 85% accuracy the student will complete P. 2 of the workbook. (See attached sheet.)

c.) The student can show his understanding through the use of manipulative objects to describe union and intersection.

d.) As an enrichment activity, the students in groups of 2-10 can play an "Attribute Game", McGraw Hill.

Materials

a.) Houghton Mifflin - Modern School Math Workbook

b.) Houghton Mifflin - Modern School Math Programmed

c.) Attribute Games - McGraw Hill

d.) Houghton Mifflin Test - P. 18, pgs. 9-17

Worksheet 1 - Houghton Mifflin Modern School Mathematics - 85% accuracy; see attached sheet.

Name_____ Score_____

SETS; Union and Intersection

Name the sets by listing the members.

1. P = {the letters between g and m in the alphabet} = _____

2. Q = {the letters in the word "chicken"} = _____

3. R = {the letters in the word "electric"} = _____

4. S = {whole numbers between 5 and 9} = _____

5. T = {odd numbers less than 10} = _____

6. V = {even numbers between 1 and 7} = _____

Use the sets in Exercises 1-6 to complete the following.

7. $P \cap Q$ = _____

8. $S \cap V$ = _____

9. $T \cap V$ = _____

10. $S \cup V$ = _____

11. $P \cap R$ = _____

12. $S \cap T$ = _____

13. $P \cup R$ = _____

14. $S \cup T$ = _____

15. $Q \cap R$ = _____

16. $V \cup P$ = _____

17. $P \cup Q$ = _____

18. $Q \cup P$ = _____

Use the sets in Exercises 1-6 to draw diagrams showing the intersections of the following pairs of sets.

In exercises 19 and 20, U = {Whole numbers}

19. S and T

20. T and V

In Exercises 21 and 22, U = {letters of the alphabet}

21. P and R

22. Q and R

MA 7-X-X-X
SC 7-X-X-X

# SCIENCE AND MATH CORRELATION SEQUENCE

## SEVENTH GRADE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Imogene Lacey
Don Bennett

MATHEMATICS AND SCIENCE COORDINATED CURRICULUM FOR SEVENTH GRADE

Statement of Purpose

In an effort to coordinate the math-science curriculums at Pueblo School, it was felt the following items were essential:

1) that both areas should use and define vocabulary in the same manner.

2) that units be sequenced so that mathematical processes used in science be taught prior to their application in an actual science experience.

3) that processes and structures used in both areas be well-outlined to minimize student confusion.

4) that seventh grade students receive an adequate background to prepare them for their eighth grade math and science courses.

5) that the present seventh grade mathematics textbook be used, not necessarily in the exact sequence outlined by the publisher, but in a logical order which will facilitate our program.

6) that not only the textbook be used, but also a series of supplemental work sheets and labs to be coordinated from various other sources.

7) that all students have and maintain a math-science notebook in the manner described in the enclosed letter to their parents.

II. Mastery of the following mathematical skills is necessary for any student to work competantly in his science sourses:

1. AVERAGE -- The student will always be required to show the <u>total</u> which he obtained in adding a series of figures, before dividing by the number of figures added to obtain the average.

2. PERCENTAGES -- When figuring a per cent, the student may use one of the two following methods: a) Move the decimal point to the right two places in the dividend, and then divide. Example - $4/5 = 5\overline{)400}^{80\%}$

   b) Divide the number and obtain a decimal quotient. Then multiply this quotient by 100 to get the final percent. Example - $4/5 = 5\overline{)4.00}^{.80}$ $.80 \times 100 = 80\%$

3. STATISTICS -- Tables and Graphs.

   a. Both should always have a title.

   b. Both should be drawn with a ruler.

   c. All scales should be evenly spaced on graphs.

   d. Both scales should be labeled on the graphs.

   e. To skip a large amount of numbers on a scale, a zig-zag line can be used from the origin to the number with which the scale begins.

   f. All graphs should have their origin at the point zero-zero.

   g. Scales should not go much higher than the largest number to be graphed.

4. METRIC SYSTEM -- In mathematics the student will learn the relationship between metric units and their relative sizes. The primary measuring units will be mm. and cm.

5. SCIENTIFIC NOTATION -- This is used primarily in calculations performed in eighth grade science. A brief background will be given to the seventh graders. Rule: All numbers will be rounded off to the hundredths place when calculating in scientific notation, unless otherwise stated.

6. RATIO AND PROPORTION -- Ratios may be written as fractions (Three is to four = 3/4). The proportion Three is to four as six is to X, may be written and solved as follows:

$$3/4 = 6/X$$

$$3X = 6.4 \quad (6.4 = 24)$$

$$X = 8$$

7. AREAS, PERIMETERS, AND VOLUMES -- Accent here will be on applying metric measures to various formulas in geometry. This is also a preliminary unit for eighth grade use.

8. MEASURING ANGLES -- Simple use of a protractor will be demonstrated.

9. GENERAL SKILLS -- Students should be able to manipulate fractions, decimals, and whole numbers in all basic mathematical processes (addition, subtraction, multiplication, and division).

## SEQUENCE OF UNITS

### Key to Materials

MSC - Modern School Mathematics Text
AM - Aftermath Book Text
MA 7- Mathematics 7th grade Text
EM - Experiments in Math Text
D - Dittos
MS - Mathset

| Weeks | Dates | Materials | Units |
|---|---|---|---|
| 1 | Sept. 5-8 | | Orientation and Review of Operations |
| 2 | Sept. 11-15 | MSC Sections 13-1, 13-2 D13A, D13B, AM 4-25 Section Test | Ratio and Proposition |
| 3 | Sept. 18-22 | MSC Sections 13-3, 13-4 Section Test | Percents and Percentages |
| 4 | Sept. 25-29 | MSC Section 13-5, 13-6 D 13C Battleship gam AM3-72 AM3-73 Am 3-70 AM 3-83 18A, 18B | Statestics, Bar and Broken line graphs |
| 5 | Oct. 2-6 | MS Graphing 29A, 29B, 29C, 29D MSC Section 13-7, AM2-8 AM2-9, AM 4-45, AM 3-86 Section and Chapter Tests | Frequency Distributions graphs, Averages Mean |
| 6 | Oct. 9-13 | MSC Section 2-2, 2-4, 2-5 Section Test, Chapter Test | Assoc., Communities, Dist., Properties |
| 7 | Oct. 16-20 | MSC 5-1, 5-2, D-5A, D-5B AM 2-37, AM 4-28 Section Test | Additions and Substractions Algorithms Bases |
| 8 | Oct. 23-27 | MSC 5-3, 5-4, D-5C, D-5D D 5E Section Test | Multiplication and Division Algorithms |
| 9 | Oct. 30-Nov. 3 | MSC 10-1 (Vocab only) MSC 1-2 Section Test | Basic Laws of Rational Numbers |
| 10 | Nov. 6-10 | MSC 10-3, 10-4, 10-5 M7-36,37,38,39 AM 3-75 AM 3-76, D-10A, D-10B | Adding and Substracting Rational Numbers |
| 11 | Nov. 13-17 | MSC 10-6, 10-7, 10-8 Chapter Test | Multiplication & Div. Rational Numbers |
| 12 | Nov. 20-24 | MSC 11-1, 11-2, M7-52 M7-13, D 11A, D 11B, D11C Section Test | Decimal Numeration |
| 13 | Nov. 27-Dec. 1 | MSC 11-3, 11-4, M7-27 M7-54, D 11D, D-11E Section Test | Algorethms of Add.& sub. of Decimals Approximations |
| 14 | Dec. 4-8 | MSC 11-5, 11-6, M7-53 Section Test | Renaming Decimals & Fractions, Terminating and Repeating Decimals |
| 15 | Dec. 11-20 | MSC 11-7, 11-8 M7-57 M7-61, Chapter Test | Algorithm of Mult. & Div. of Decimals |

| | | | |
|---|---|---|---|
| 16 | Jan. 2-5 | MSC 14-1, 14-2, 14-3<br>AM 4-34, AM 4-31, AM 4-32, AM 4-33,<br>Section Test | Addition and Sub. of Negative Numbers |
| 17 | Jan. 8-12 | MSC 14-4, 14-5 AM 4-35<br>Chapter Test | Multiplication & Div. of Negative Numbers |
| 18 | Jan. 15-19 | P. 177 8th gr. book<br>AM 4-43 | Metric System |
| 19 | Jan. 22-26 | MSC 12-1, 12.2, 12.3<br>Am 4-5 D12A<br>MS 181, 182, 183, 84 | Length and Perimeter<br>Angle Measurement |
| 20 | Jan. 29<br>Feb. 2 | MSC 12-4, 14-5, 14-6<br>AM 3-87 AM 4 47<br>Section Test AM 3-60<br>Am 1-36, Am 3 71, Am-4-4, AM 2-47, AM 3-87 | Triangles & Quadrilateral Area, Circles |
| 21 | Feb. 5-9 | MSC 12-7, 12-8<br>Chapter Test | Right Angles Rectangular Prisms |
| 22 | Feb. 12-16 | MSC 1-1, 1-2, 1-3<br>Section Test | Sets and their uses |
| 23 | Feb. 19-23 | MSC 1-4, 1-5, Am 1-23<br>AM 2-35, AM 4-11, M 7-7<br>M 7-8 | Intersection and Union of sets |
| 24 | Feb. 26<br>Mar. 2 | MSC 4-1, 4-2, M 7-16<br>M7-11, Section Test | Ancient Number systems |
| 25 | Mar. 5-9 | MSC 4-3, 4-4, D-4A<br>AM 2-25 AM4-28 | Exponents & Power<br>Power of Ten, Sq. Roots |
| 26 | Mar. 12-16 | MSC 4-5, 4-6<br>Chapter Test | Expanded Notation |
| 27 | Mar. 19-23 | MSC 6-1, 6-2, 6-3, 6-4<br>AM 1-38 AM 1-44<br>Section Test | Scientific Notation<br>Points lines<br>Planes |
| 28 | Mar. 26-30 | MSC 6-5, 6-6<br>Chapter test | Intersection of Lines<br>Vocabulary |
| 29 | Apr. 2-6 | MSC 7-1, 7-2 | Prime Numbers |
| 30 | Apr. 9-13 | MSC 7-3, AM 1-39, AM 1-40<br>AM 1-41, AM 1-42<br>Section Test | Divisibility Tests |
| 31 | Apr. 16-20 | MSC 7-5, 7-6, 7-8<br>Chapter Test | Prime Numbers<br>GCF, LCM |
| 32 | Apr. 23-27 | MSC 8-1, 8-2 | Line Segments |
| 33 | Apr. 30<br>May 4 | MSC 8-3, 8-4, 8-5<br>Chapter Test | Angles, Conruent, Segments & Angles |
| 33-36 | REVIEW & | 8TH GRAD. | |

MA8S7*

# SETS IN EIGHTH GRADE MATHEMATICS

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Ed Coats

TOPIC: Sets in 8th Grade Mathematics

CONCEPTS:

1. sets of numbers
2. opposites or negatives
3. order and comparison of rational numbers
4. absolute value

OBJECTIVES:

1. Be able to write in set notation the sets of integers, natural numbers and whole numbers.
2. Be able to graph any rational number on a numbers line.
3. Be able to indicate whether one rational number is less than, greater than or equal to a second rational number.
4. Given a starting point coordinate on a number line, be able to indicate with a directed line segment (a ray) the addition of any positive or negative rational number.
5. Be able to determine the absolute value of any signed number.

PRE-TEST: Sets and Rational Numbers

I. Solve the following, using set braces where necessary:

1. The set of all the days of the week is

_____

2. The set of all the numerals on a clock is

_____

3. The number you would use to describe a temperature of 5 degrees below zero is _____

4. The opposite or negative of 6 is _____

5. The union of the two sets (2,5,6,8) and (2,3,5,8,9) is the set _____

6. Specify the members of the set of all whole numbers less than 5 _____

II. Insert one of the symbols $<$ , $=$ , or $>$ so that the following statements are true.

7. 3 _____ 5

8. 4 _____ -2

9. -5 _____ -6

10. $|-5|$ _____ $|-3|$

Outline of Content and Activities for Sets

Textbook study in Modern School Mathematics - Chapter 1 pages 1-25

Transparencies for review:

Sets and Subsets

Using Sets

Intersection and Union of Sets

Transparencies for development and expansion

Sets of Numbers

Order of Numbers

Arrows on the Number Line

Small group work:

Use city attribute game to teach recognition of sets by characteristics. Continue with groups until everyone completely understands.

Written textbook exercises:

In each assignment, assign section A for students having difficulty; sections A and B for those average students; sections A, B and C for the superior students.

Written Exercises: 1-20 Page 5

1-32 Page 12-13

1-22 Page 16

1-26 Page 20-21

1-31 Page 24-25

Suggested Resource Materials

Modern School Mathematics Course 2 - Houghton Mifflin

Math Applications Kit - SRA

Plus (A handbook of math experiments and activities)

Singer Math Kit DD - L. W. Singer Co., Inc.

Suggestions for Correlation

ART: Use of colored overlays to demonstrate sets and subsets of colors.

SCIENCE: Use of attribute games to teach relationships by attributes or characteristics.

LIBRARY SCIENCE: Application of the study of sets to a study of the library decimal usage with its sets of numbers ranging from one to another depending upon the category of the books.

Physical Education: Study of the olympic gymnastics point system, the set of rational numbers between 0 and 10.

SOCIAL STUDIES: Use the "set" terms in describing those groups of people voting for President Nixon, etc. in the upcoming election; those states voting Republican or Democrat.

POST-TEST: Sets and Rational Numbers

I. Solve or complete the following, using set braces where necessary.

1. The intersection of the two sets (2, 5, 7, 8) and (4, 5, 8, 9) is the set _____.

2. The set of all numbers having numerals that are fractions $\frac{a}{6}$, where a is a whole number and 6 is a counting number, and the negative of such numbers is called the set of _____numbers.

3. Because the graph of -7 lies to the left of the graph of -6 on a horizontal number line, _____ _____.

4. The negative of a negative number is a _____number.

5. Specify the members of the set of all negative integers greater than -5.

6. The absolute value of +4 is _____.

II. If S = (-3, -2, -1, 0, 1, 2, 3), solve the following:

7. Specify the members of the subset of S that consist of all the whole numbers in S _____.

8. Specify the members that consist of all the integers_____.

III. Let T = $(-\frac{4}{3}, -1, 0, \frac{2}{3}, 3, \frac{4}{1}, 6\frac{2}{5})$. Specify the members of the subset of T that consists of:

9. All the non-negative numbers in T _____.

10. All the rational numbers in T _____.

MA-8-M-6

# RATIO AND PROPORTION

## GRADE 8

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Ed Coats

## OBJECTIVES

Pueblo's 8th grade math program for 1972-73 is a combination of demonstration, exploration and individualization. For the most part, all students are studying the same concepts at the same time only with variations of assignments. The upper and lower level students are plugged into individualized programs where possible, depending upon the materials available and the availibility of assistance. The self-pacing material, then, is not a seperate independent course but a temporary course for remedial help and enrichment.

The eighth grade math is being directly correlated with eighth grade science. Therefore, most math concepts include objectives that are science related. Following are the objectives of the first concepts to be taught, ratio and proportion:

1. Be able to interpret data given as a ratio.
2. Be able to express given data as a ratio.
3. Be able to interpret data given as a proportion.
4. Be able to express given data as a proportion.
5. Be able to solve for the missing part of a proportion.

## Outline of Evaluative Techniques

Pre-test: The individual who can attain nearly 90% accuracy on a pre-test is given alternatives to math study and/or enrichment that include the following: preparation of class materials; independent individual or small group projects for presentation; individualized instruction and study through the use of Individualized Mathematics, the Continuous Progress Learning Laboratory or any one of the several supplementary sources available (See the list under Retrieval System.)

Post-test: This is used primarily as a skill test to check mastery of objectives outlined under the particular concept. Any real low score here indicates need for further work on the concept, probably through placement into one of the lower level supplementary sources for a short period of time with the aid of an instructor, possibly another student. Preferably most remedial individual work should be done during independent study so that the sudent might remain with the large group for introductory material and interaction with the group; this depends upon the student and the material presented.

Math Notebook: Each student maintains a current math notebook which is evaluated much like a lab manual. The notebook contains dated daily lessons, answer sheets to all self-pacing programs, quizzes, records of experiments performed and projects completed, and manipulative materials used. Each of the headings is sectioned off within the notebook by tabs appropriately labeled on the divisors.

Personal File Folder: Each student has a personal file folder kept in the classroom which contains the pre-test and unit tests given throughout the year, the skill sheet, plus any other math work appropriate for a personal folder where safekeeping is important.

Grades: Depending upon the individual, the grading system varies from a very individually subjective one to a sophisticated objective one. Generally speaking, the objective point system is used. Grades are then based upon the average obtained from the following criteria: individual initiative (20%), daily work (20%), unit tests (20%), scheduled quizzes (15%), maintenance of math notebook (15%), pop quizzes (10%). Individual initiative is determined by any attempt to seek help; to research and write about discoveries; to devise and present experiments and/or problems; to participate in and offer constructive suggestions to a small group.

Skill Sheet: Each student maintains a current sheet showing test results and any follow-up procedure for each skill tested.

Pre-test: Ratio and Proportion

Note to student: It is not expected that you can do all or even many of the following exercises, but it is necessary that I know your level of understanding of them before we study similar problems.

I. Fill in the missing numerals.

1) $\frac{5}{4} = \frac{5 \times 9}{4 \times}$ 2) $\frac{33}{22} = \frac{33 \div}{22 \div 11}$ 3) $\frac{15}{7} = \frac{30}{}$

4) If $\frac{4}{y} = \frac{3}{7}$, then $4 \times 7 = y \times __$

5) If $\frac{n}{2} = \frac{6}{5}$, then $n \times 5 = 2 \times __$

II. Solve the following:

1) Find y if $\frac{y}{3} = \frac{8}{12}$

2) Find w if $\frac{12}{9} = \frac{w}{3}$

3) If there are 180 boys in a school and the ratio of boys to girls is 4 : 3, then how many girls are there in the school?

4) Find the batting average of a player whose ratio of hits to times at bat was 3 : 8.

5) Bill can read 15 pages in 6 minutes. How many pages can he read in 8 minutes?

Ratio and Proportion

Worksheet #1: Basic Property of Fractions

If a, b, and c denote whole numbers, and if $b \neq 0$ and $c \neq 0$, then:

1. $\frac{a}{b} = \frac{a \times c}{b \times c}$ and 2. $\frac{a \div c}{b \div c} = \frac{a}{b}$

I. Use the basic property of fractions to help you name the value of n for which each of the following statements is true:

1) $\frac{1}{2} = \frac{n}{6}$ 2) $\frac{3}{7} = \frac{n}{14}$ 3) $\frac{n}{5} = \frac{20}{20}$

4) $\frac{9}{4} = \frac{18}{n}$ 5) $\frac{5}{n} = \frac{35}{28}$ 6) $\frac{4}{n} = \frac{24}{30}$

7) $\frac{55}{11} = \frac{5}{n}$ 8) $\frac{17}{34} = \frac{n}{2}$ 9) $\frac{10}{6} = \frac{20}{n}$

10) $\frac{n}{4} = \frac{9}{12}$

II. Name a fraction in lowest terms or a simple numeral for a whole number that represents each of the following rational numbers.

1) $\frac{4}{20}$ 2) $\frac{6}{48}$ 3) $\frac{49}{21}$ 4) $\frac{10}{100}$

5) $\frac{22}{33}$ 6) $\frac{33}{15}$ 7) $\frac{0}{7}$ 8) $\frac{9}{3}$

9) $\frac{15}{15}$ 10) $\frac{12}{10}$

Ratio and Proportion

Worksheet #2: Comparison Property of Fractions

If a, b, c, and d denote whole numbers such that $b \neq 0$ and $d \neq 0$, then one and only one of the following statements is true:

$$\frac{a}{b} < \frac{c}{d}, \quad \frac{a}{b} = \frac{c}{d}, \quad \frac{a}{b} > \frac{c}{d}$$

I. Make a true statement by replacing each question mark with the sign $<$ , $=$ , or $>$ .

1) $\frac{5}{8} \quad ? \quad \frac{9}{16}$ 2) $\frac{3}{7} \quad ? \quad \frac{5}{14}$ 3) $\frac{13}{16} \quad ? \quad \frac{25}{32}$ 4) $\frac{3}{4} \quad ? \quad \frac{8}{10}$

5) $\frac{17}{22} \quad ? \quad \frac{22}{15}$ 6) $\frac{36}{48} \quad ? \quad \frac{102}{136}$ 7) $\frac{23}{18} \quad ? \quad \frac{31}{24}$ 8) $\frac{17}{25} \quad ? \quad \frac{10}{17}$

9) $\frac{53}{170} \quad ? \quad \frac{10}{29}$ 10) $\frac{123}{235} \quad ? \quad \frac{71}{81}$

II. Determine the set of all whole-number values of n for which the given sentence is true.

1) $\frac{3}{4} < \frac{5}{n}$ 2) $\frac{7}{9} > n$ 3) $\frac{1}{n} > \frac{1}{3}$ 4) $\frac{n}{3} < \frac{8}{11}$ 5) $\frac{8}{3} < \frac{6}{n}$

III. Solve the following:

1) One brine solution contains 3 pounds of salt dissolved in 45 pounds of water. Another brine solution contains 7 pounds of salt dissolved in 106 pounds of water. Which solution is saltier? Why? ( Hint: recall the product of the means compared to the product of the extremes. )

2) A pitcher won $\frac{15}{17}$ of the games that he played. Another pitcher won $\frac{49}{55}$ of the games that he played. Which pitcher had the better record? Why?

Ratio and Proportion

Worksheet #3 ( To follow the study of Chapter 13 Section 1 Ratio and Proportion in Modern School Mathematics Course 1 ... a review from last year. )

I. Solve the following:

1) Find y if $\frac{y}{3} = \frac{8}{12}$

2) Find w if $\frac{12}{9} = \frac{w}{3}$

3) If $\frac{3}{t} = \frac{7}{8}$, what is the ratio of t to 8?

4) If $\frac{8}{7} = \frac{3}{t}$, what is the ratio of t to 7?

5) Find the batting average of a player who got 180 hits out of 300 times at bat. ( Be sure to express the answer as a decimal.)

6) A train can travel 210 miles in $3\frac{1}{2}$ hours. At this rate, how far can it travel in 5 hours?

7) Mr. Jones paid a real estate tax of $600 on his house which had an assessed evaluation of $9,000. Mr. Shaw paid a real estate tax of $908. What was the assessed value of Mr. Shaw's house?

8) A baseball player's batting average was .482 and he had 500 times at bat. How many hits did he get?

RATIO AND PROPOPTION:

Classroom Demonstration

PURPOSE:

Once the idea of ratio and proportion is established in the concrete, it can be better dealt with in the abstract.

MATERIALS:

Yard stick, meter stick, 20 small hooks or screws, and an assortment of small weights

INSTRUCTIONS:

Screw five hooks at even intervals in each side of center of both the yard stick and meter stick. If the hooks are not placed at even intervals, the sticks will not be balanced at the start of the demonstration. Make a 1/4 inch hole in the center of each stick (at the 18" mark on the yard stick and the 50cm mark on the meter stick) and insert a pencil or similar object to serve as a fulcrum.

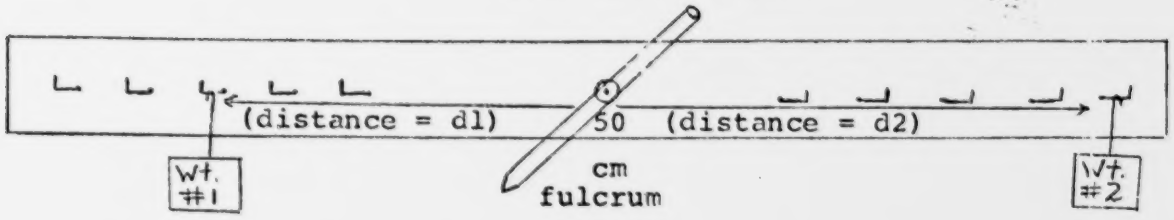
PROCEDURE:

Practice changing weights from hook to hook to maintain balance.

CONCLUSION:

It soon becomes evident that there is a relationship (a proportion) between the weight and distance of the weight from the fulcrum on one side and the weight and distance on the other side. This relationship is written in equation form: wt #1 x d1 = wt #2 x d2

METER STICK BALANCE




This demonstration shows that: wt#1 x d1 = wt#2 x d2

Ratio and Proportion: Follow-up assignment to the classroom demonstration. Worksheet #4.

Using any one of the true proportions arrived at in the demonstration, complete the following table.

| wt#1 | d1 | wt#2 | d2 |
|---|---|---|---|
| 5 gm | 3 cm | | 15 cm |
| 50 gm | 25 cm | 100 gm | |
| 10.5 gm | | 63 gm | 6 mm |
| | 400 mm | 4 kgm | 100 mm |
| 12.5 gm | 29 cm | 22 gm | |

Question: What would you have to do if d1 were given in centimeters and d2 in millimeters and both wt# 1 and wt #2 were in grams?

Example: $\frac{12 \text{ gm}}{3 \text{ cm}} = \frac{8 \text{ gm}}{\text{mm}}$

Would the answer be 2 mm? 20 mm ( which equals 2 cm )? What do you think?

Ratio and Proportion: Related Scientific Use

In your science class, you will soon discover that ratio and proportion are used to solve many measurement problems. This lesson will help you understand some typical science problems.

**Problem:** Find how much of an iceberg lies below the surface of the water.

Solution: It is possible to measure the amount or height sticking out of the water, but there is no practical way of measuring what lies beneath. But, you do know that an ice cube is representative of an iceberg, and you can measure the depth of an ice cube under water: so, set up a proportion.

Let's say that the height of the cube sticking out is .3 cm. and the depth of the cube under water is 2.8 cm. Then, if you are told that the height of an iceberg above water is 100 ft., the depth under water can be figured by setting up a proportion:

$$\frac{.3 \text{ cm}}{2.8\text{cm}} = \frac{100 \text{ ft}}{n}$$

Solving, we have $.3n = 280$ or $n = \frac{280}{.3}$ which gives $.3\overline{)280.0}$

Moving the decimals over one place, we have $3\overline{)2800.00}$ $\begin{array}{r} 933.33 \end{array}$ rounded to the nearest hundredth. So, $n = 933.33$ ft.

Problem: A weight hung on a spring or thin wire may stretch the wire .1 inch. Twice the weight will stretch it .2 inch and so on until the wire approaches its breaking point. Given a particular ratio, determine how much different weights will stretch the wire.

Solution: We say that the stretching is proportional to the weight. Or, this may be written mathematically as $\frac{w1}{w2} = \frac{s1}{s2}$ where $\frac{w1}{w2}$ is the ratio of the two weights and $\frac{s1}{s2}$ is the ratio of the stretching for these two weights.

Actual Problem: A certain spring will stretch 12 inches before nearing its breaking point. If a 5# weight stretches the spring 1 inch, tell how much the spring will be stretched by:

1) 10#  2) 1#  3) 50#

4) 12#  5) 4oz.

## RATIO MOBILE

Independent activity for several slow students.

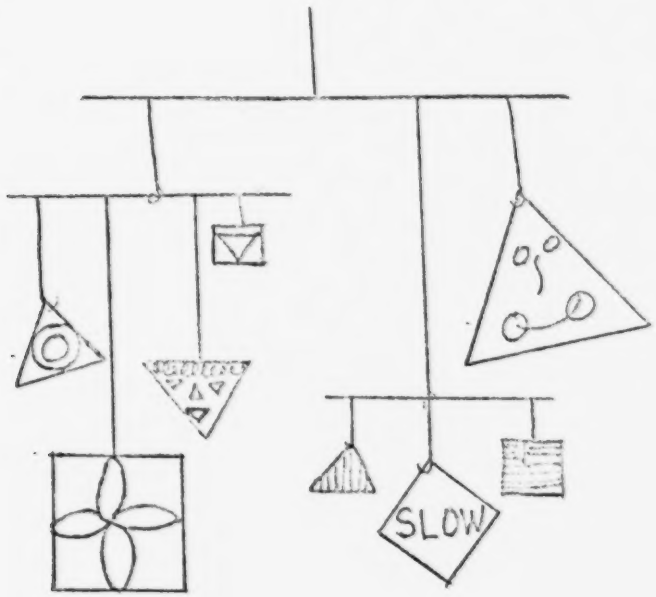
Purpose: To establish a concrete idea of ratio and proportion so that it can be better dealt with in the abstract.

Materials: scissors, poster board, thin wire, ruler and pencil

Instructions to the student: Construct and cut out of poster paper a square and a triangle with sides of 10 inches each. Then construct and cut out 2 similar figures each with ratios to the first figure of $\frac{1}{2}$, $\frac{2}{5}$, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{4}{5}$, and $\frac{3}{5}$.

Finally, color or otherwise decorate the geometric figures you have made and attach them onto wire to form a mobile. We'll hang the mobile from the ceiling to enhance the appearance of the room.

Hopefully your mobile will look at least as nice as the one drawn below.

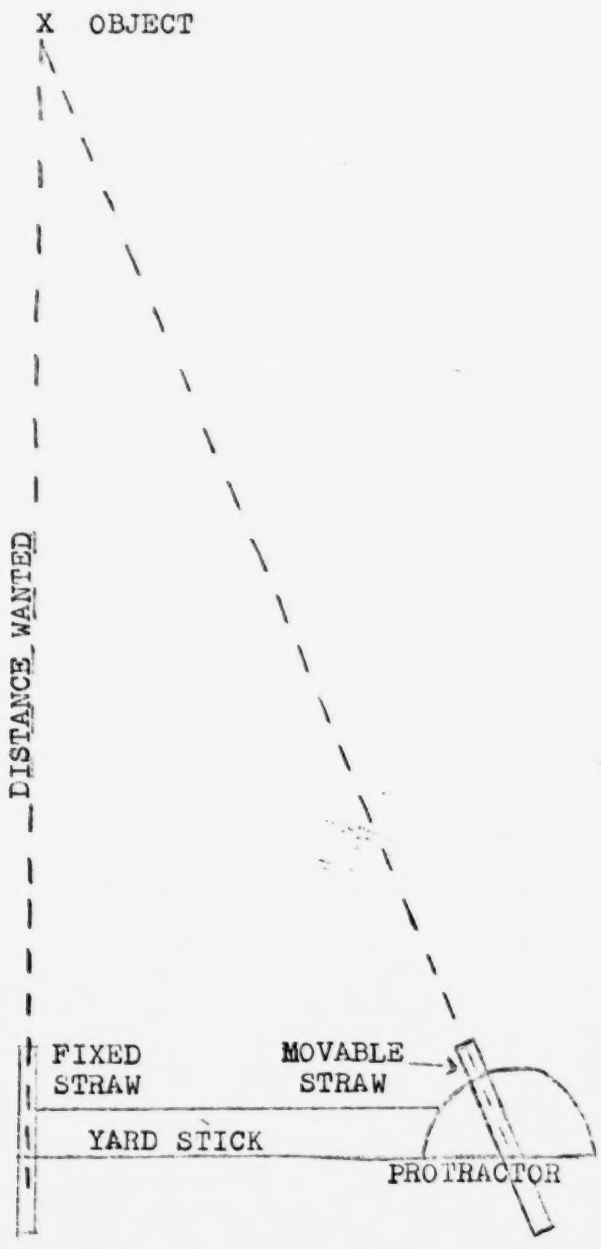


Independent activity for advanced group of about five students.

( Assumes knowledge of similar triangles. )

Student: Build the following instrument for use in determining unknown distances through use of ratio and proportion.

Through the fixed straw, sight the object whose distance is desired. Then sight the object through the movable straw. Measure the angle with the protractor. Then make a scaledrawing of a similar triangle. Then use proportions to find the desired distance. Be prepared to discuss your results in class.



Post-test: Ratio and Prportion

Note to student: You should be able to achieve 80% accuracy on the following problems. If you do not, please see me after class to set up additional help time.

I. Solve the following proportions for the unknown value.

1) $\frac{50}{100} = \frac{n}{2}$

2) $1 : 25 = 4 : n$

3) $\frac{3 \text{ gm}}{12 \text{ cm}} = \frac{20 \text{ gm}}{n}$

4) $\frac{.08}{y} = \frac{.12}{.18}$

5) $\frac{.4 \text{ cm}}{3.5 \text{cm}} = \frac{200'}{n}$

II. Solve by using proportions:

1) Water weighs 1 gram per cubic centimeter. What is the weight of 40 cubic centimeters of water?

2) Three inches on a map represents a distance of 73 miles. What distance is represented by 5 inches?

3) A building casts a shadow of 280 ft. at the same time that a 21 ft. pole casts a shadow of 35 ft. . How tall is the building?

4) If a plane travels at a rate of 416 miles per hour, how far will it travel in 13 minutes?

## Materials for Retrieval

Individualized Mathematics Drill and Practice Kit DD

Math Applications Kit

SRA Cross Number Puzzles

Aftermath 1, 2, 3, 4

Continuous Progress Learning Laboratory
Series 700 and Series 800

Experiencing Mathematics Workbooks A, B, C, D, E

Individualizing Mathematics Skills and Patterns

Individualizing Mathematics Patterns and Discovery

The Franklin Mathematics Series

Skills and Patterns In-Depth Topics

Tuf
Base "Two" Flash Card Set

Equations (Came)

Addition of Integers (Film Loop)

MA--8-X-X-X
SC--8-X-X-X

# PHYSICAL SCIENCE AND MATH

# CORRELATION SEQUENCE

# EIGHTH GRADE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Ed Coats
Reed E. Done

PHYSICAL SCIENCE/MATH CORRELATION- 8th Grade

THE PROBLEMS

A. SCIENCE

The philosophy of the Pueblo School Science Curriculum stresses the importance of student participation and involvement science materials, his environment and thought processes. Since much of science deals with measurement, the ability to use math and measurement techniques correctly in obtaining data is of prime importance. Previous years have shown that students have found difficulty in recalling math concepts and "transferring them" to the subject area of science. The science teacher re-taught the math again-- a time consuming, as well as inefficient, duplication of effort.

B. MATH

Students successfully complete a math course only to be stymied by practical application in science class, necessitating re-teaching. Or, in other cases, while students are studying congruence of plane figures in math class, they may be using scientific notation in science class -- without yet having studied scientific notation in math class.

Thus, the real problem arises: a need to correlate math and science. Students need to see how one complements the other; they need to see and feel a unity of purpose in school instruction instead of a seperation into seemingly unrelated classes.

THE PROPOSED SOLUTION:

1. Determine the scope and sequence of the 8th grade Physical Science Course.

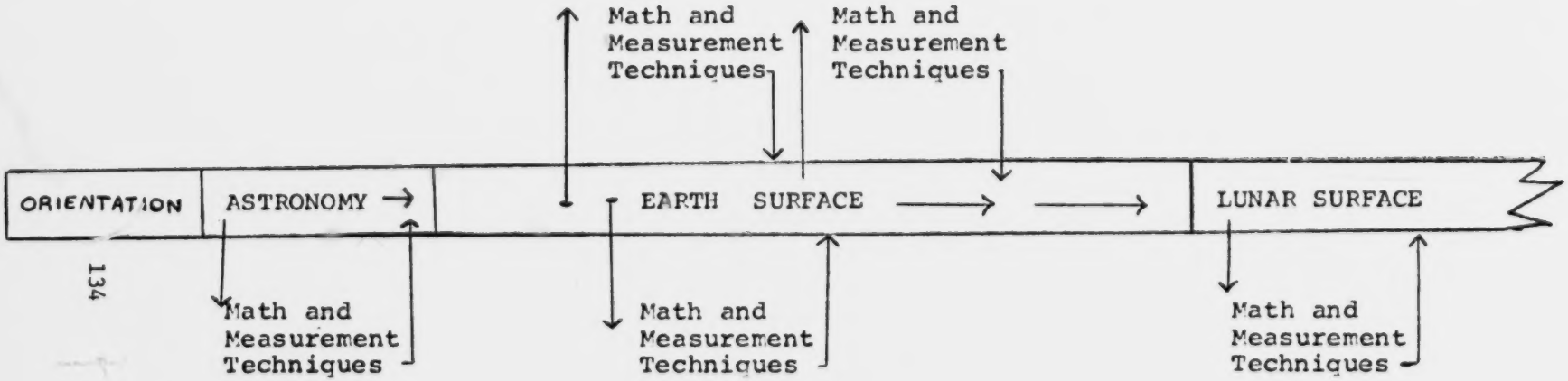
2. Determine, via a time line, the approximate time a particular math concept would be used by the student during the science course.

3. Correlate the 8th grade math scope and sequence with that of science in order that the student would have the necessary "fresh" math background ready for application in his 8th grade science course.

It is felt by the authors that both math and science will hold greater meaning for the student and he will have greater level of success in both courses of the above solutions are implimented.

## PHYSICAL SCIENCE SEQUENCE FLOW CHART - EXAMPLE

("Time, Space and Matter" modified)




NOTE: Students requiring Math and Measurement Techniques leave the sequence path to aquire said skills via work in Math and Science classes.

## PHYSICAL SCIENCE/MATH CORRELATION - 8th GRADE

| Math Concept Number Teaching Sequence (see key pp. 136-141) | Math Concept Number (see key pp. 136-141) | Math Concepts* Required in Physical Science | Approx. Weeks |
|---|---|---|---|
| | | | 0 |
| 1.0 to 1.6 | | | 1 |
| 2.0 to 2.6 | 1.0 | Decimals & percent | 2 |
| | 2.0 | Fract. parts | |
| 3.0 to 3.1 (b) | 3.0 | Multiples | 3 |
| 4.0 to 4.2 | 4.0 | Rates | |
| 5.0 to 5.1 (b) | 5.0 | Averaging | 4 |
| | 6.0 | | |
| 6.0 to 6.6 (a3) | | | 5 |
| | | | 6 |
| 7.0 to 7.9 | 7.0 | Basic Equations | 7 |
| 8.0 to 8.15 | 8.0 | Decimal Est. | |
| 9.0 to 9.4 (c) | 9.0 | Graphing Tech. | 8 |
| | | | 9 |
| 10.0 to 10.4 (a) | 10.0 | Scientific notation | 10 |
| | | | 11 |
| 11.0 to 11.3 (e) | 11.0 | Rectangular & prismatic area & volume | 12 |
| 12.0 to 12.0 | 12.0 | Circular & Spherical Dimen. | 13 |
| 13.0 to 13.1 | 13.0 | Formula transposing | 14 |
| | | | 15 |
| | | | 16 |
| | | | 17 |
| | | | 18 |

*MATH CONCEPTS ARE CUMULATIVE THROUGH THE SCIENCE COURSE AND ARE NOT RELISTED EACH TIME THEY ARE REQUIRED BY THE STUDENT TO SOLVE/INVESTIGATE NEW PROBLEMS.

## KEY TO MATH CONCEPT NUMBERS AND SEQUENCE

| Concept Number | Description |
|---|---|
| 1.0 | Decimal and percent |
| 1.1 | Decimal place values |
| a. | Reading and writing |
| b. | Writing in expanded form |
| 1.2 | Comparing and arranging decimal numbers |
| 1.3 | Adding and subtracting decimals |
| a. | Algorithm for addition |
| b. | Algorith for subtraction |
| 1.4 | Multiplying and dividing decimals |
| a. | The multiplacation algorithm |
| b. | The division algorithm |
| 1.5 | Converting decimals, fractions, and percents |
| 1.6 | Solving percentage problems |
| a. | Finding a percent of a number |
| b. | Finding a number when a percentage of it is known |
| c. | Finding the percentage one number is of another |
| d. | Solving interest problems |
| 2.0 | Determining fractional parts |
| 2.1 | Adding rational numbers |
| a. | Adding rational numbers |
| b. | Adding negative rational numbers |

MATH KEY CONTINUED

| Concept Number | Description |
|---|---|
| 2.2 | Properties of addition |
| a. | Closure |
| b. | Commutative |
| c. | Associative |
| d. | Additive-identity |
| e. | Additive-inverse |
| 2.3 | Subtracting rational numbers |
| 2.4 | Multiplying rational numbers |
| a. | Multiplying a rational number and a nonnegative rational number |
| b. | Multiplying two negative rational numbers |
| 2.5 | Properties of multiplication |
| a. | Closure |
| b. | Commutative |
| c. | Associative |
| d. | Multiplicative-identity |
| e. | Multiplicative-inverse |
| f. | Distributive |
| 2.6 | Dividing rational numbers |
| 3.0 | Multiplies (review) |
| 3.1 | Determining multiples |
| a. | using the division algorithm |
| b. | Approximating multiples of distance |
| 4.0 | Rate |
| 4.1 | Solving general rate problems (speed in MPH, etc.) |
| 4.2 | Solving specific scientific rate problems (spin/orbit,wear/time,etc.) |

MATH KEY CONTINUED

| Concept Number | Description |
|---|---|
| 5.0 | Averaging |
| 5.1 | Mean, median, mode |
| a. | Applying to general problems (grade, salaries, etc.) |
| b. | Applying to specific scientific problems (avg. of shadow angles, avg. of pendulum periods, etc.) |
| 6.0 | Angles |
| 6.1 | Constructing geometric figures |
| a. | Using construction and measuring materials |
| 6.2 | Determining parallel lines |
| a. | A transversal |
| b. | Corresponding angles |
| c. | Interior and exterior angles |
| d. | Alternate angles |
| e. | vertical angles |
| 6.3 | Angles of a triangle |
| a. | acute angles |
| b. | obtuse angles |
| c. | right angles |
| 6.4 | Angles of a rectangle |
| 6.5 | Bisecting an angle |
| 6.6 | Similarity and congruency |
| a. | Constructing similar triangles |
| b. | Constructing congruent triangles |
| 1. | Angles-side-angle |
| 2. | side-angle-side |
| 3. | side-side-side |

MATH KEY CONTINUED

| Concept Number | Description |
|---|---|
| 7.0 | Writing and solving equations |
| 7.1 | Number phrases |
| a. | using a variable |
| b. | determining the replacement set |
| 7.2 | Open number phrase |
| a. | determining the number represented by following directions |
| 7.3 | Statements and open number sentences |
| a. | an equation |
| b. | an inequality |
| c. | a statement |
| 7.4 | Determining solutions of a mathematical sentence |
| 7.5 | Using common sense in solving equations |
| a. | solving by inspection |
| 7.6 | Solving equations by transformation |
| 7.8 | Solving inequalities |
| 7.9 | Applying general equation principles to write and solve practical problems |
| 8.0 | Decimal estimation and precision |
| 8.1 | Terminating decimal numerals |
| 8.2 | Repeating decimal numerals |
| 8.3 | Irrational numbers |
| 8.4 | Real numbers |
| 8.5 | Rational approximations |
| 8.6 | Comparison property of numbers |
| a. | Comparing by decimal numerals |
| 8.7 | Density property of rational numbers |
| 8.8 | Density property of real numbers |

MATH KEY CONTINUED

| Concept Number | Description |
|---|---|
| 8.9 | Property of completeness of the set of real numbers |
| 8.10 | Greatest possible error in measurement |
| 8.11 | Significant digits in measurement |
| 8.12 | Rounding off to specified digits |
| 8.13 | Relative error in measurement |
| 8.14 | Making actual precise decimal measurements |
| 8.15 | Making actual estimates of decimal readings and measurement |
| 9.0 | Graphing Techniques |
| 9.1 | Writing data |
| a. | compiling a data table |
| 9.2 | Divided-bar graph |
| 9.3 | Circle-graph |
| a. | sectors |
| 9.4 | Bar and broken-line graphs |
| a. | vertical data |
| b. | horizontal data |
| c. | determining the trend |
| 10.0 | Scientific notation |
| 10.1 | Exponents |
| a. | multiplying in exponential form |
| b. | dividing in exponential form |
| c. | writing decimal numerals as powers of ten |
| 10.2 | Zero and negative exponents |
| a. | writing decimal numerals as negative powers of ten |
| 10.3 | Expressing a number in scientific notation |

MATH KEY CONTINUED

| Concept Number | Description |
|---|---|
| a. | Finding the "standard position" |
| b. | Counting from the standard position to the decimal point |
| 10.4 | Multiplying and dividing in scientific notation |
| a. | applying to actual scientific problems |
| 11.0 | Area and volume of geometric figures |
| 11.1 | Understanding units of measurement |
| a. | square units |
| b. | cubical units |
| 11.2 | Plane figures (area) |
| a. | rectangle |
| b. | triangle |
| c. | circle |
| d. | parallelogram |
| e. | trapezoid |
| 11.3 | Solid figures (surface area and volume) |
| a. | pyramids |
| b. | prisms |
| c. | cones |
| d. | cylinders |
| e. | spheres |
| 12.0 | Applying knowledge of circles and spheres to practical scientific spherical measurement problems |
| 13.0 | Formula transposing |
| 13.1 | Applying the formulas used in textbook problems to actual situations posed in math, science, etc. |

# PHYSICAL SCIENCE SEQUENCE OUTLINE

("Time,Space, and Matter" Revised Sequence)

| SCIENCE TOPIC | MATH CONCEPT NUMBER | SCIENCE APPLICATION OF MATH CONCEPT |
|---|---|---|
| 1. Orientation | | |
| A. Watson-Glaser Test of Critical Thinking(pre-test) | ___ | |
| B. Recording Data (Standards/Methods) | ___ | |
| 2. The Physical World | | |
| A. Observation vs. Interpretation | ___ | |
| B. Purpose, Precision & Approximation | ___ | |
| C. Microcosm vs. Macrocosm | ___ | |
| 3. Apparent Celestial Motion | 1.0 | Score/Grade Calculations |
| A. Part I Stars | ___ | |
| B. Part II Stars, Moon, Sun | ___ | |
| 4. Earth's Moon Phases | | |
| A. Part I Duplication Model | 2.0 | Fractional Parts of Moons Cycle |
| B. Part II Data Interpretation | 3.0 | Earth, Moon, Sun Relative Distance |
| 5. Jupiter | | |
| A. Moons Orbit? | ___ | |
| B. Planet Spins? | ___ | |
| 6. Earth's Moon Spins? | | |
| A. Model | 4.0 | Rate of Spin/Orbit |
| 7. Stars Orbit? | | |
| A. Star "Trails"Interp. | | |
| 8. Earth Spins? | | |
| A. Pendulums | 5.0 | Average of Periods |
| B. Foucault Pendulum | | |

| SCIENCE TOPIC | MATH CONCEPT NUMBER | SCIENCE APPLICATION OF MATH CONCEPT |
|---|---|---|
| 9. Earth Orbits or Sun Orbits? | ___ | |
| A. Kurile Island Photo and Eclipse | | |
| 10. Sun Spins? | ___ | |
| A. Sun Surface | | |
| B. Sun Spots | | |
| 11. Planet Orbits? | | |
| A. Earth's Moon Phase Review | | |
| B. Phases of Venus | | |
| C. Size-Distance Relationship | | |
| D. Elongation | 6.0 | Diagram viewing angles to plot orbit of Venus |
| 12. Earth Orbits? | ___ | |
| A. Ptolomy | | |
| B. Copernicus | | |
| 13. Earth's Surface-Agents of Change | ___ | |
| A. Restricted & Dramatic | | |
| B. World wide & Gradual | | |
| 14. Running Water | | |
| A. Hydraulic Action | 7.0 | Mass & Distance Calculations using unequal arm balance |
| | 3.0 | Estimating values between scale graduation on balance |
| | 9.0 | Graphing mass change with time |
| 15. Abrasion Rates | 4.0 | Rate of change in mass |
| A. Quartz | | |
| B. Calcite | | |

| SCIENCE TOPIC | MATH CONCEPT NUMBER | SCIENCE APPLICATION OF MATH CONCEPT |
|---|---|---|
| 16. Form & Substance | | |
| A. Melting | 8.0 | Temperature Pattern |
| B. Boiling | 8.0 | |
| C. Evaporation cycle | ___ | |
| D. Paradichloro Benzene | ___ | |
| 17. Solution | | |
| A. crystals | ___ | |
| B. solubility limit | ___ | |
| 18. Change & The Grand Canyon | | |
| A. Cause of? | | |
| B. Age? | | |
| C. Princeton Analogy | 10.0 | Floor abrasion rate & duration |
| D. Quartz Abrasion rate | 9.0 | Rate of wearing |
| E. Topographic maps | 7.0 | Reading contour lines |
| 19. Grand Canyon Dimensions | | |
| A. Area & volume | 11.0 | Area & volume of canyon |
| B. Drainage area | 11.0 | Area of drainage surface |
| | 9.0 | Rate of sediment deposition |
| 20. Leveling/Uplifting Mechanism | ___ | |
| 21. Shape of Earth | | |
| A. Apollo Photos | ___ | |
| 22. Density of Earth | | |
| A. Surface & above | ___ | |
| B. First Approximation | 10.0 | Express density of First Approx. |
| 23. Size of Earth | | |
| A. Shadow Angles | 12.0 | Spherical measurements |
| | 5.0 | Measure shadow angles |
| | 13.0 | Calculate radius of earth via the earth's circumference |
| | 10.0 | Same |

| SCIENCE TOPIC | MATH CONCEPT NUMBER | SCIENCE APPLICATION OF MATH CONCEPT |
|---|---|---|
| 24. Mass of the Earth | | |
| A. Density X Volume | 10.0 | Calculate mass of earth to first approximation |
| 25. Moon's Surface - Cause & Change | | |
| A. Compared to Earth's Features | 8.0 | Plotting Earth vs. Moon crater profiles to scale |
| B. Impace vs. volcanism | — | |
| C. Crater classification | — | |
| D. Sequence of event in Mare Imbrium area | — | |
| 26. Watson-Glaser Test of Critical Thinking (post-test) | — | |